THE IRON AGE

New York, November 18, 1915

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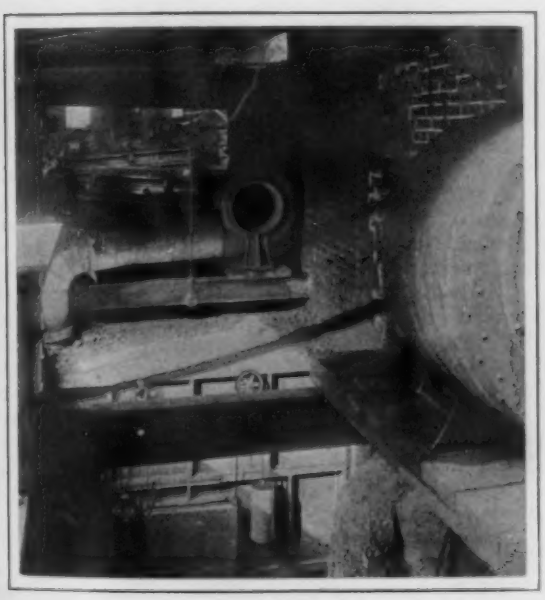
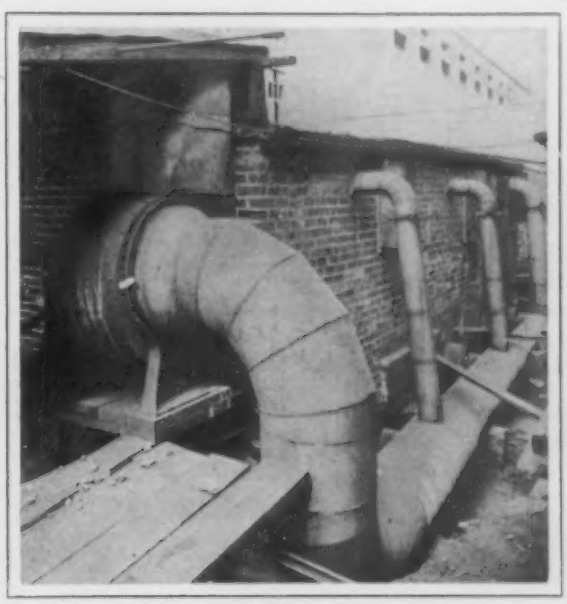
A Core-Oven Mechanical Draft Installation

Some Details of the Combined Forced-Blast and Exhaust Fan Drying Equipment of the Modern Foundry Company, Oakley, Cincinnati

A combined forced and induced draft installation for its core ovens is in use at the plant of the Modern Foundry Company, Oakley, Cincinnati, Ohio. The difficulty of securing throughout the oven the desired diffusion of the products of combustion and air mixed with them for the drying of the cores by depending alone on either the forced draft or the induced draft led to the combination along lines which have proved efficacious in general ventilation work. With the opportunity to present some of the proportions of the plant, the accompanying illustrations have been prepared and the following account is based on information obtained from L. E. Eisensmith, representative in the Cincinnati territory for the American Blower Company, Detroit, which supplied the ventilating, or perhaps better called, gas moving equipment.





The Core Ovens Are Equipped with a Forced and an Induced Draft Fan, the Former Being Located Over the Core Oven Furnace, as Shown at the Left and the Other Over the Fuel Pit. The Exhaust Connections at Top and Bottom of Each of the Three Ovens Are Shown in the Right-hand Illustration.

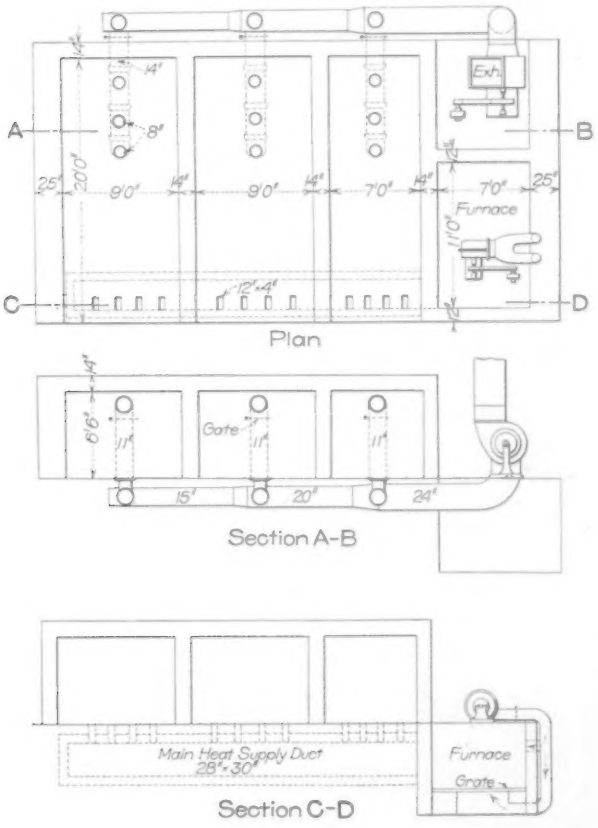
The accompanying drawings include a plan of the core-oven plant and a section to show the forced blast portion of the equipment and a section to show the induced draft portion. The forced draft fan is located above the furnace of the ovens and the exhauster is located above the pit for the furnace fuel. The forced draft fan delivers partly through the grate of the furnace and partly to the combustion chamber of the furnace, and the mixture of the products of combustion and air is delivered into an underground heat supply duct which serves as a plenum chamber from which the gases reach the three ovens of the drying plant. It will be noted that the scheme is to admit the drying medium at distributed points in the bottom at the front of each core oven. The idea then is that the gases will flow backward across each oven.

For the removal of the gases, which have in the meantime of course taken up considerable quantities of moisture from the cores, there are three openings in the floor of the ovens and one near the top of the oven in the back wall. The combined area of the three floor outlets is about 50 per cent greater than the area of a single outlet near the top of the oven. This arrangement has been adopted to secure circulation within the oven and an equable condition as regards temperature and drying capacity at all points, and the use of the exhaust fan provides for the positive eduction of the gases and vapor, while the positive delivery of the forced draft apparatus is depended on to maintain such pressure that there will not be short circuiting currents within the ovens. Emphasis is laid on this fact as important, particularly in treating large cores so as not to have parts over-dried while others are still green.

The forced blast fan is of the Sirocco type, of

No. 3 size, operated at a speed of 746 r.p.m., belt driven as indicated in one of the reproduced photographs from a 2½ hp. electric motor, this size of motor being somewhat greater than ordinarily required for the fan because of the hot conditions under which the unit has to operate. It is designed to supply about one-third of the air for combustion, by delivery through the 18 sq. ft. of grate area provided, and the remaining two-thirds over the fire to lower the temperature of the gases, thereby avoiding injury to the cores, while also supplying an atmosphere with maximum opportunity for the admission to it of the moisture emanating from the cores.

The main heat supply duct, underground as stated, has a cross sectional area about 10 per cent greater than the combined area of the 4 x 12-in.



Air is Forced into the Core Ovens, Part Through the Fuel Bed to Support Combustion and Part Over it to Augment and Cool the Products of Combustion, and the Gases Are Moved by Fans Through Distributed Openings at Opposite Ends of the Ovens

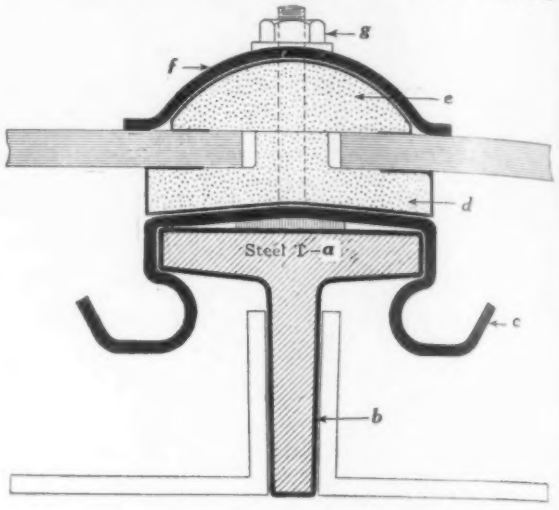
openings through which the gases reach the ovens. Blast gates provide for controlling or regulating the delivery from the fan and there are also blast gates on the exhaust branches from top and bottom of each oven. The exhauster is also a Sirocco fan, driven at 520 r.p.m. by a 5-hp. motor.

Bristol pyrometers are installed at the rear of each of the three ovens. At this writing figures are not obtainable as to the saving of time in the matter of drying cores, but it is estimated that about 25 per cent represents the result, while a better core is produced, it is claimed, than was the case before the accelerated drying was attempted with mechanical movement of the air.

Italian imports of scrap iron and steel for the first six months of this year are officially placed at only 89,615 metric tons against 177,340 tons for the first half of 1914. Pig-iron imports were 96,594 tons against 122,066 tons a year ago for the six months. Imports of steel blooms and ingots, however, were 56,575 tons to July 1, against only 10,997 tons to July 1, 1914.

A New Type of Skylight Construction

A form of skylight bar construction known as the Waugh glazing construction, employing asbestos protected metal and a condensation gutter, the latter entirely separate from the steel skylight beam, has been



Arrangement of the Various Parts of the Waugh Glazing Construction

developed by the Asbestos Protected Metal Company, Pittsburgh, Pa. It is designed to secure freedom from corrosion and from glass breakage due to deflection of the bar.

The skylight beam used is a plain standard section, being a T in the case shown. This bar *a* is covered and hermetically sealed by a special coating *b*. As a preliminary the steel is freed from grease, moisture, oxides and other surface impurities, after which the steel is heated uniformly and immersed in a bath of an asphalt compound. As an additional protection a covering of asbestos felt is pressed into the asphalt while it is soft and hot and this in turn is protected by a coating of special fume and moisture-proof hardening material, the nature of which depends upon the particular service to be rendered. This coating, it is pointed out, is both heat and fire resisting, protects the steel from stray electric currents and galvanic action, and does not take up any great amount of room, being about the same thickness as a 3½-lb. sheet of lead. To collect and dispose of the condensation that sometimes has to be taken care of with a single sheet of glass, special gutters *c* are fitted snugly over the top of the bars and serve as anchors for the bolts holding the glass in place. This is also made from the company's special metal.

The glass construction rests directly upon a cushion *d* of asphaltic compound. The outside edges of the glass plates and the joints between them are covered and bridged with a half-oval section of asphaltic compound *e*. The cap filler is protected against the elements by a cap *f*, also of protected metal. The low flat-arch shape, it is emphasized, makes it possible to draw up the cap bolts until the whole cap is under tension without breaking the glass, this tension being then utilized to lock the nuts. The cap bolt, nut and washer *g* is of special shape and is made of non-corrodible metal, such as brass, phosphor bronze or monel metal.

Scarcity of steel wire rope is pronounced in Russia, causing great inconvenience to the petroleum producers of the Baku district, according to Consul General John H. Snodgrass of Moscow. Previous to the war wire rope and wire to be made into rope were imported from England, but British wire rope has almost disappeared from the market with the price advanced 300 to 400 per cent.

The Southern Foundry Company, Owensboro, Ky., has been awarded a contract by the Excelsior Drill Company, Springfield, Ohio, for a year's supply of castings. The contract amounts to about 1200 tons.

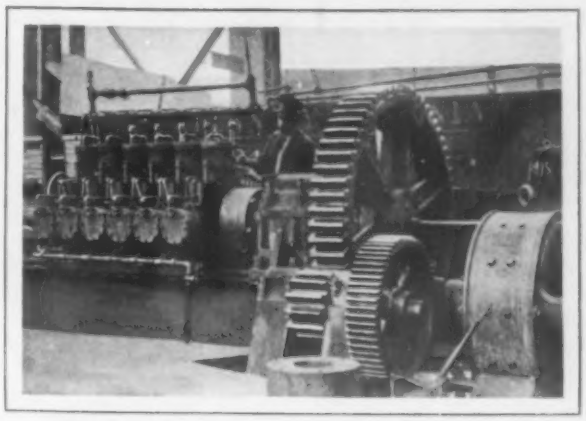
An Air-Operated Cutting-Off Machine

The line of metal working machinery built by the Southwark Foundry & Machine Company, Philadelphia, Pa., has been extended to include cutting-off machines. These are of the air-operated type with one or more heads. The single-head machine is adjustable to vary the length of the slugs cut from the bar and the multiple machines have the head fixed in position to cut one length of slug unless the arrangement of the piping is changed. The diameter of the bars handled ranges from 1 to 6 in., the variation in size being taken care of by changing the bushing in which the stock rests while being cut.

The machine consists of a power driven headstock with a chuck that grips the end of the bar. This is mounted on the end of a rigid cast-iron bed upon which are one or more air operated cutting-off heads. The headstock and the reduction gears are used for driving the bar, the power being obtained from an electric motor. Hardened steel bushings in the center of the cutting-off heads support the bar as it rotates, the bushings being slightly larger than the diameter of the stock being cut.

The cutting-off heads have three air cylinders, two at diametrically opposite points and one on the top, the arrangement of these heads being shown in the larger of the accompanying illustrations. Each air cylinder forces a cutting-off tool into the steel, all the tools being in line and cutting in the same kerf. All three tools on each head are set into the work at once by a common air valve and cut away the metal until a breaking section of approximately 25 per cent of the original diameter of the bar is left at the center. This feature is necessary to comply with the specifications for most round bars from which shells are made, as the specifications contain provision for a fracture test. An air pressure of between 80 and 90 lb. is required, although if the size of the cylinders is increased it is possible to operate the machines at a lower pressure.

In the single-head type of machine a long air cylinder at the end of the bed moves the cutting-off head along the work and various lengths of slugs are obtained by moving the head for each cut. In the case of the multiple-head machine it is possible to vary the position of the heads along the bed, but the air piping has to be changed to correspond with the different lengths of the slugs.

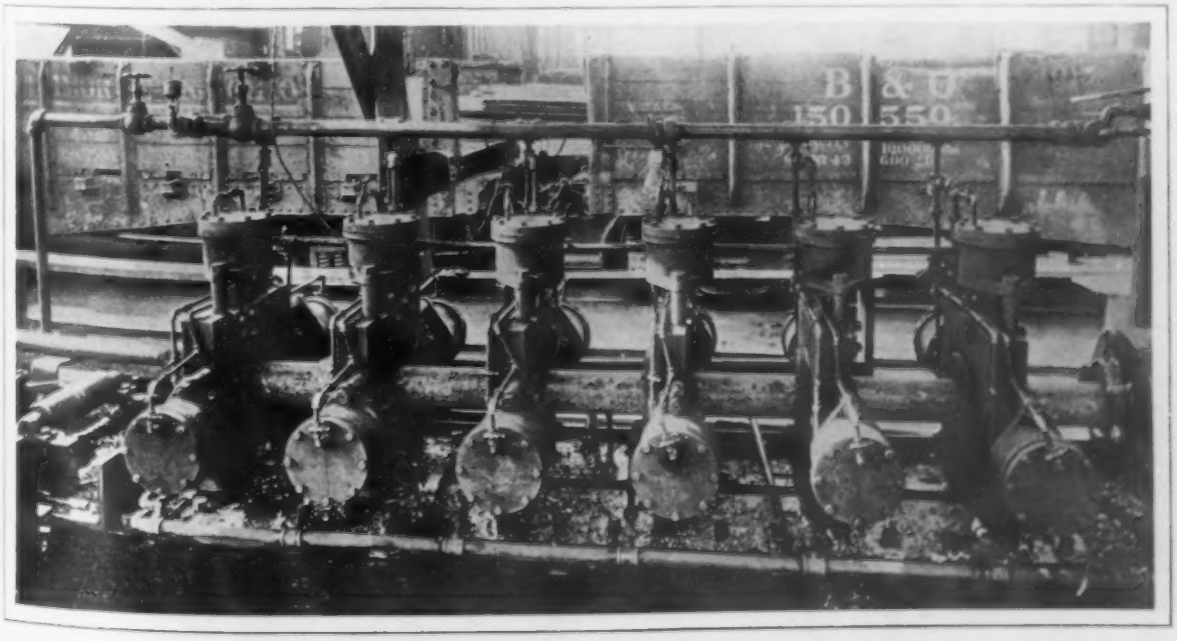


An Air-operated Machine for Cutting off Slugs from Cold Metal Bars Ranging from 1 to 6 In. in Diameter with the Heads Grouped Together

A bar of 0.55 per cent carbon steel, 3½ in. in diameter, has been cut in 35 sec. and a machine with six heads recently cut 2035 slugs 9⅞ in. long from a bar measuring 5 7/16 in. in diameter in 24 hr.

Spontaneous Combustion of Land-Stored Coal

For the storage of bituminous coal, an open shed with enough superstructure to support the overhead mechanical devices used for handling is better and safer than the closed type, according to George R. Crapo in the *Journal* of the American Society of Naval Engineers. The overhead conveyor system with the apron 45 to 60 ft. above the floor of the shed is not desirable because of the heat generated by the coal in its fall. The heat is smothered by subsequent discharges from the buckets and a large amount of fine coal dust due to breakage results from the height of the fall. The author is strongly in favor of temperature readings to guard against spontaneous ignition, but he does not believe that too much dependence should be placed upon them, as the coal having the highest thermometer reading does not always take fire first. A promiscuous use of water in extinguishing fires in a coal pile, it is pointed out, has no great value, as in some cases the temperature of a pile of coal will increase almost to the coking point and subside, while if the water is used at such a time the coking will take place immediately, thus losing coal that otherwise might be saved.



The Machine Arranged to Cut Slugs 19¼ In. Long from a 5¼-In. Round Bar

The Process of Case Hardening*

High Temperatures and Short Cuts to Be Avoided—Influence of Time and Temperature Upon Results—Case and Core Treatment

BY R. A. MILLHOLLAND†

There is an axiom that always comes into my mind whenever the subject of case hardening is mentioned, and it is this: The depth of carbon penetration in case hardening depends on the time of heating and the temperature at which the work is heated. This is not a new theory in case-hardening practice by any means, for it has been known for a considerable number of years by a very few clever men who did not see fit to talk much about the matter, preferring to keep it as a trade secret. Another good axiom to heed is, high temperatures produce poor results. By high temperatures I mean temperatures above 1700 deg. Fahr. The proper case-hardening range lies between 1600 and 1700 deg.

There are an infinite number of reasons why the higher temperatures should be avoided in case hardening. The greatest reasons are: First, the use of temperatures above 1700 deg. Fahr. for case hardening will cause too much carbon to be absorbed in the carbonized area and a supersaturated case is the result; second, the high temperatures will cause excessive crystallization of the steel that is being carbonized and serious difficulty will be experienced in refining both the case and the core. Between 1600 and 1700 deg. Fahr. the core structure is not very materially changed by the ordinary heating time, which on a rough average is about 4 hr. Crystallization does take place to a certain extent, but the refined structure is quickly restored by careful treatment. The lower carbonizing temperatures minimize the possibility of the pieces warping during carbonizing. Temperatures below 1600 deg. Fahr. are, as a general rule, impractical from the economical standpoint, if for no other reason. The speed of penetration is so much greater at 1600 to 1700 deg. Fahr. that it is impractical to use the lower temperatures where cost is an item to be considered. The depth of penetration varies in a direct ratio with the temperature; that is to say, at 1700 deg. more carbon penetration will be secured in a given time than will be secured at 1600 deg. Fahr. in the same length of time.

The time and temperature factors are very important in case hardening, and to strike a happy medium of temperature and time, is at once both highly desirable and very difficult. A disregard of either factor will result in disaster. On several occasions I have been asked why certain steels seemed to burn out when they had been subjected to long carbonizing heats. Never in all my experience did I find the steel to be the real cause, in almost every case it was due to the use of temperatures above 1700 deg. Fahr. Generally coupled with the overheating, the practice of dumping the parts directly from the pots was employed. Both are very poor practice, but the combination of the two is bound to give some mighty poor results. A certain manufacturer was trying to defend the practice of dumping directly from the pots, but he admitted that his product gave 100 per cent more service when reheated to refine the core, and he showed me several test records to that effect.

SHORT CUTS TO BE AVOIDED

The writer could cite innumerable incidents to prove the superiority of complete heat treatment over the short cuts that are so often used to economize on case-hardening expense. "Safety First" signs are conspicuously displayed in almost every shop in the country and yet the manufacturer, in some cases, still clings to the before-Noah-and-the-Ark practice of quenching the carbonized pieces directly from the pot, and calling the case-hardening operation complete. It is always best, when at all possible, to allow the parts to cool in the pots before they are removed from the carbonizing compound. There is a dual reason for doing this. The first is that the carbonizer is saved from oxidation by the air which would render it almost useless for further service, and the second reason is that on heats longer than 4 hr. the crystalline structure of the core is so coarsened that the hardened part will not have the strength consistent with the factor of safety, upon which principle all conscientious manufacturers build their products. However, on heats of less than 4 hr., it is generally the case that the parts can be quenched from the pot and then treated to refine the case, which will give a result that will fill all but the most exacting requirements. The one objection to this practice as applied to this particular method is that the carbonizer can only be used once before it loses much strength. The reason is that the air, containing as it does a large per cent of oxygen, oxidizes the carbon in the carbonizer and makes the carbonizer useless for further work. If, however, a cheap carbonizer is used, similar to one of those I have already mentioned, a material saving in actual carbonizing cost can be effected.

On work of a larger nature which requires a longer heating time than 4 hr., it is essential to treat both the core and the case. Especially is this true of parts that are subjected to shock and vibration. To the uninitiated it is astounding to see what the actual difference is between a properly and an improperly treated case-hardened part. It is safe to put the difference in strength at a minimum of 50 per cent for both the tensile strength and the resistance to shock.

METHODS OF TREATING CASE AND CORE

Now let us consider the most practical method for treating both the case and the core to secure the best results. After the piece has been carbonized the first object is to refine the core. The practice in all cases is the same, whether carbon or alloy steels are being treated. The only variation to be considered is the critical temperature of the original steel as received from the mill prior to the carbonizing operation. In the standard mill specification open-hearth, case-hardening stock the critical temperature is very close to 1650 deg. Fahr., and is the one at which the core of the case-hardened part should be treated.

*Discussions of the materials and the retorts and furnaces employed in case hardening appeared in THE IRON AGE, Nov. 4 and 11, 1915, respectively.

†Consulting metallurgist Millholland Tool Company, Indianapolis, Ind.

There are many different methods for doing this, and I shall only touch briefly on the two most important ones. For rough work that is to be ground all over after hardening, or for work that will allow a slight amount of distortion and scale, I believe heating in the open furnace to be the most economical method that can be employed. A large amount of work can be handled rapidly, materially reducing the amount of labor per piece. The ordinary commercial heat-treating furnace can be used to the best advantage. By a pyrometer or some other device the temperature of the furnace should be regulated to 1650 deg. Fahr. and the furnace charged with the parts to be treated. It is essential that the temperature of the furnace be regulated as nearly correctly as possible in order that the steel is not over heated. When the parts are thoroughly saturated with heat and the pyrometer indicates that the heat is what it should be, the work should be quenched in a heavy oil. From careful experience and experimenting I find for quenching from the higher heats employed in heat treatment that an oil having a specific gravity of 22 Baumé, a flash point of 420 deg. Fahr. and an ignition temperature of 480 deg. Fahr. is suitable. These specifications conform to practically all fire insurance regulations, and at the same time the oil can be obtained at considerably less than the many special oils sell for.

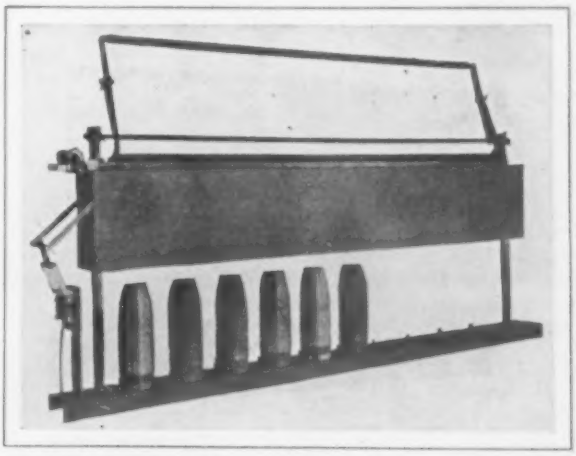
The other method for treating the core is used chiefly on transmission gears and ordnance equipment and anywhere that distortion and scaling must be held to a minimum. The lead bath is used in this method to heat parts. The lead is heated in crucible furnaces designed for that purpose and the parts are immersed in the molten lead and held there until they are thoroughly heated and then quenched in practically the same manner that the furnace-treated pieces are. The advantage of this method is that the pieces are uniformly heated in a bath that excludes all air and prevents oxidation. The result is that the parts come from the oil free from scale and distortion is reduced to a minimum. In both methods the work should be transferred from the furnace to the oil quenching tank as quickly as possible to secure the greatest strength in the core.

Following the treatment of the core the case should receive even more careful attention than the core. A hard surface is the primary object of case hardening, and unless the case has the desired hardness no matter how much care has been bestowed on the core the effort is wasted if the case is not hard enough to fill requirements. The essential principles of treating the case are identical with those involved in treating the core. The work is heated to the critical temperature of the case, which in open-hearth steel will be about 1400 to 1425 deg. Fahr., and this time it is quenched in fresh water, or where extreme hardness is desired it is quenched in brine. The lead pot is used extensively where the work must be free from scale, but work that is to be finish-ground all over can be very satisfactorily heated in the ordinary furnaces. It is always a good policy to run test pieces through with each lot so that there is some means of checking the results that are being obtained. The test piece should show at least 5 deg. deflection before a complete fracture is obtained. The fracture should show a soft core of a moleskin-like texture, and the case should look like the fracture of a file or that of nicely hardened tool steel.

The same principles of heat treatment apply to alloy steels as they do for plain carbon steels. The only differences are that the critical temperatures of alloy steels vary somewhat from those of carbon steels, and it is the general rule that alloy steels will harden quite satisfactorily in a light quenching oil. This last feature has a strong tendency to minimize cracking during hardening. In every instance the up-to-date steelmakers can better determine what are the best temperatures at which to treat their respective brands, but no matter what the make of steel is, be it carbon or alloy, the principles governing the case-hardening of it are the same the world over.

Electric Baking Unit for Explosive Shells

To effect a saving in the time required for baking the copal varnish on the inside of high explosive shells and to provide a simple, compact and easily operated unit for doing this, an electric heater has been developed by the Consolidated Car-Heating Company, Albany, N. Y.



Pushing Down the Asbestos Cover Puts the Electric Heater into Operation, and the Current is Turned off when the Paint or Varnish on the Shells is Baked and They Are Removed

The heater unit has a substantial channel-iron base on which the shells are placed. Above is a sheet metal asbestos-lined hood containing the heating elements. This is arranged to slide up and down, and when down the heating elements are in the correct position in the shells, the latter being covered by the hood. The heat thus passes directly to the surface to be baked and the hood prevents excessive loss by radiation. The baking can now be done, it is stated, in one to one and one-half hours.

A feature is the automatic operation of the control switch which throws the current on when the hood is down over the shells and cuts it off when the hood is raised. This prevents waste of current which would result from careless operators leaving the heat on when no shells are being baked.

The heating element is of the type in use for heating electric railroad cars. It operates on alternating or direct current up to 600 volts.

Works Accidents That Begin in Play

The following bulletin just issued by the safety committee of the Youngstown Sheet & Tube Company, Youngstown, Ohio, deals with a phase of accident prevention work which has been brought into unpleasant prominence by happenings at a number of plants: "We have just had one man badly hurt while engaged in a 'kidding' match. This is not the first instance of the kind that has happened in our works. Wrestling, scuffling, horse play, kidding and goosing have no place in any working establishment. Things may be started in all innocence and without intent to cause harm, but too often there is some unforeseen happening that results in a serious or perhaps fatal accident to one or several employees. Cut out the kidding game."

Evolution of the Malleable Process*

Early Practice and Poor Iron—How the Elements Jointly Act on Properties—Lesson from the Benefits of Scientific Investigation and the Microscope

BY J. P. PERO AND J. C. NULSEN

The process of making malleable iron was slow in entering into a transitory stage, but once started it gained headway and we doubt if any other industry has taken so large a stride in the right direction in the past few years. Very few really know how much more ductile and strong the malleable iron of to-day is than that made twenty-five years ago.

Within a quarter of a century pig iron was bought by fracture almost entirely. The blast-furnace man paid little attention to manganese, sulphur and phosphorus. We know that he was not always right as to silicon, for an iron higher in carbon than another will show more mottles even with the same silicon content; he was dealing with two variables, where he figured on but one.

HOW THE MALLEABLE MIXTURE WAS MADE

The white iron mixture from which malleable iron was made was arrived at in a very crude way. The method was rule-of-thumb. The initial charge averaged 3.5 on the basis of pig-iron grading. The charge for a ten-ton heat was as follows:

The sprue and scrap might be considered as equivalent to No. 6 grade pig iron. Then if 10,000 pounds of sprue and scrap were used, 9000 pounds of No. 1 pig iron and 1000 pounds of No. 4 pig iron, the average grade of the heat would be 3.65, which for this case might have been deemed near enough to be satisfactory.

Some manufacturers did not even use an empirical formula. Some of the iron made at this time stood up as well. But plenty of bad heats were made even when the initial charge was as desired (around 3.5). The iron of this period varied greatly and was not reliable. Chemical analysis was suggested as a means of improvement.

The second period dates back about twenty-five or thirty years, chemical laboratories having been introduced into a number of plants from 1885 to 1890. Pig iron then could be bought by analysis as well as by grade. The empirical method of figuring charges was eliminated and the practice of obtaining the percentage of silicon in the initial charge was adopted.

IMPORTANCE OF PHOSPHORUS AND SULPHUR

But even with chemical laboratories, bad malleable iron continued to make itself manifest. The principal difficulty was that the chemist did not know just what elements caused the trouble and those that he did analyze for he considered in the wrong light. Many chemists thought that silicon was the main factor, while carbon was seldom considered. We know now that the silicon content has an important bearing, but that the determination of silicon without knowing the carbon content gives almost useless information.

Chemists knew that phosphorus and sulphur were important in determining the quality of steel, so they proceeded to restrict it in malleable. Here again the sulphur content is uninteresting unless we know the manganese, and we are just recently beginning to believe that phosphorus has needlessly alarmed us in malleable iron.

The success of the chemical laboratory, as then constituted, was doomed to failure. Poor iron persisted and people concluded chemical analysis was no help; in many plants it was abandoned. But the need for improvement began to be felt more and more, and after several years malleable iron manufacturers began to take up chemical analysis again.

From 1895 to 1900 many malleable plants again equipped chemical laboratories, doing their best to solve some of the problems which confronted them, but they continued to look at the analysis in the same light as that of steel, and this more than any other fact prevented the discovery of the main difficulties. The different elements were considered independently as to the effects produced and the possibility of one element modifying or changing the effect of another was not considered.

STEELY IRON

One of the most perplexing difficulties encountered was the occasional appearance of "steely iron." It showed a white, steely fracture after being annealed and remained so even after having been re-annealed. Such iron usually shows a high tensile strength, but is inferior when tested transversely. Its ductility is almost nil. This iron was obviously unsuited for railroad castings or any subjected to shock. It was a "Sword of Damocles" over the head of the malleable iron trade. On analysis it was found to be low in silicon and for a time steely iron was supposed to be the result of allowing the silicon to get below a certain limit.

Just about the time malleable manufacturers were congratulating themselves on the fact that the cause of steely iron had been found, some one submitted a sample with silicon 0.94 per cent. All hopes of arriving at the correct solution were shattered. This was not the only trouble. The general practice then was to analyze for carbon, silicon, manganese, sulphur and phosphorus. It was considered that all carbon present in the iron after annealing was in the temper graphite form and, therefore, a great many chemists analyzed the iron on the basis of total carbon. This was wrong, but it resulted in many perplexing problems.

Malleable iron of inferior quality sometimes was obtained, but when analyzed it showed nearly the same chemical contents as that of excellent quality. This was puzzling and the determination of the cause seemed hopeless.

ASSOCIATED EFFORT AMONG PRODUCERS

This is representative of conditions up to less than ten years ago, when some of the leading manufacturers of malleable met to talk over the situation. They feared that the poor malleable would slowly but surely hurt the industry and prejudice the users, especially railroad men and implement manufacturers, against it. It was decided that, as no scientific research had ever been attempted, some eminent metallurgist should undertake this work and see if he could not help them. Such a man was finally found and wonderful results have been obtained.

We have learned that steely iron can be made with the silicon high as well as low, because carbon also was a factor. If the carbon is below certain limits it will stay in the combined state as pearlite, and cause steely iron, no matter what the silicon. Our former assumption that too low silicon caused steely iron also was correct. Iron too low in silicon cannot be forced to give up the combined carbon, no matter what the carbon may be.

In like manner we have learned that sulphur and manganese are just as closely related. Formerly it was believed that if the sulphur was below 0.05 per cent it could not harm malleable, because it did not harm steel. We used to think that an iron with 0.02 per cent sulphur was better than one with 0.06 per cent. But if the manganese in these two irons is 0.24

*From a paper presented at the convention of the American Foundrymen's Association at Atlantic City, N. J., Sept. 23, 1915.

per cent, the one containing 0.06 per cent sulphur is the better iron.

PHOSPHORUS LIMITATION

There has been some doubt as to whether the limitation of phosphorus to 0.225 per cent was not a needless precaution. The malleable iron specifications used in the past did not accomplish their purpose; they did not protect the buyer from poor malleable or assure a good quality.

Nearly all the old specifications contain a clause that malleable iron shall not contain over 0.05 per cent sulphur or over 0.225 per cent phosphorus. Nothing is said about the manganese content and, therefore, limiting the sulphur to 0.05 per cent is in some cases the means of securing bad iron rather than good. For instance, iron with a manganese of 0.34 per cent would be of inferior quality with a sulphur content of 0.05 per cent, but it would be satisfactory if the sulphur was 0.085 per cent. If a limit is placed on sulphur, the manganese content also should be limited, but it might preferably be stated that the sulphur content shall be from one-third to one-fourth the manganese content, as there is no temptation to unreasonably raise either of these elements.

The same is true as to silicon and carbon. It is meaningless to limit the percentage of the one without assigning the proper corresponding value of the other.

Perhaps the greatest improvement from this scientific work has been the introduction of microscopic investigation as well as chemical and physical analyses. Much depends on the state in which the elements exist, whether the carbon is combined with the iron to form pearlite and cementite or whether it is in the free state, as temper carbon, all of which is clearly brought out by means of the microscope.

WHAT THE MICROSCOPE HAS DONE

The microscope reveals whether a piece of malleable has been annealed too short a time or at too low a temperature; whether the annealing temperature was too high, or if the cooling was too fast, questions of doubt before this research.

The practice in many malleable plants to-day is to cast three types of test bars from each heat, one set ¾ in. square and 14 in. long for transverse test; another set of ⅝-in. round test bars for tensile strength and elongation, and one set of wedge-shaped bars for a dynamic test. The latter bars are 6 in. long and 1 in. wide. They are ½ in. thick at the base and taper to 1/16-in. thick at the point. This wedge is held upright under a drop hammer delivering a 70-ft.-pound blow and is gradually curled up with each blow. This last test is also a direct result of the research work undertaken and is one of the most severe and exacting to which malleable cast iron has ever been subjected. All of these tests have values assigned to them, to which the iron must conform before it is passed as 100 per cent. in quality.

If any fail, sections are examined under the microscope, which, with the chemical analysis, at once indicates the cause. This method of daily control explains why the iron now made is so much better in quality and runs so much more uniform than that made fifteen or twenty years ago—or even five years ago.

A few years ago, when we first began to understand the relations of the elements in malleable iron and to change the white iron mixture to conform with this knowledge, we thought wedges that stood seven 70-ft.-lb. blows represented good iron. In a short time the quality of the iron had so far improved that we decided on ten blows, and about a year ago we had to change this so that twenty blows represented 100 per cent quality; but still we are not high enough, as we are making iron that will easily average thirty-five blows.

How far this improvement may go is not known, as we have tested bars that stood 108 blows.

In like manner the tensile strength of the iron has improved. The average tensile strength of malleable made fifteen to twenty years ago was from 38,000 to 40,000 lb. per square inch. To-day at some plants it will average 50,000 lb. per square inch, and we have broken one bar that tested 71,500 lb. per square inch.

A LESSON FROM STEEL CASTING MANUFACTURERS

We may profitably take a lesson from the steel casting manufacturers who have been perfecting their product while we have been almost at a standstill. As a result, they are supplying castings which, from the nature of the service required of them, would be far more satisfactory if made from a high-grade malleable iron. Unfortunately, however, too many of our malleable manufacturers are still satisfied with the production of inferior iron and are not taking advantage of the knowledge and results obtained in securing uniformity and high quality. This attitude is detrimental to the entire industry and makes it possible for the steel casting to replace the malleable. When malleable castings fail in service, it is not the individual casting that is condemned, but malleable iron generally. A large part of the steel castings used, especially in railroad work, could be replaced by good malleable, both from the standpoint of economy and adaptability.

This may be a strong statement, but it is an incontrovertible fact that for certain classes of work malleable iron is indisputably superior to steel. Castings subjected to shock or to dynamic stresses, if made of a good quality of malleable iron, will outlast steel or any other ferrous metal, for malleable iron is not as susceptible to fatigue failure as cast steel, owing to the difference in structure of the two materials.

STEEL AND MALLEABLE IRON COMPARED

Steel is of a crystalline nature, practically uninterrupted throughout its section. The basic structure of malleable iron is also crystalline, but this structure is not continuous, but is interrupted by particles of temper carbon. Ductile materials such as cast steel and malleable iron are weaker under shear than under tension and will fail in shear whether the force applied is tension or compression.

When the applied load exceeds the elastic limit the crystals begin to slide over each other, the amount of such slipping or sliding corresponding to the permanent deformation received. As these crystals slide the infinitesimal irregularities on their surfaces interlock, which increases the friction between these two particular crystals, bringing them to rest and starting the slipping between adjoining crystals. This motion continues across the section of the metal in question until the force applied has become so great that the weaker crystals part, intensifying the stress on those remaining when the next weaker crystals part, and so on until complete failure occurs.

The surfaces over which these crystals slide are sometimes called slip planes and since the crystalline nature of steel is practically uniform and uninterrupted, it is an easy matter for these slip planes to extend themselves across the section of steel in a continuous, though irregular line, causing cracks and failure.

Malleable iron starts to fail in the same manner, but before more than one or two adjacent crystals have failed, the incipient fracture will have run into a temper carbon spot. These spots usually are located at the conjunction of three or four crystals, so that there are three or four paths along which the fracture may continue and the probability is that the one serious crack will break up, taking three or four of these paths. These new paths, in turn, run into carbon spots, regardless of whether the smaller fractures are still further broken up. In this way the advance of one large serious fracture is prevented from working straight across the section of metal.

FAILURE DUE TO FATIGUE

It is hoped that we soon may learn more about fatigue failure and establish why malleable iron is less susceptible to this than steel. Malleable iron has a further and very important advantage over steel in the soundness and solidity of its sections, provided care is taken to eliminate shrinkage spots. It is cast at a lower temperature than steel and hence is free from occluded gases which cause blowholes and unsoundness.

Soundness of section, coupled with the fact that the ratio of ultimate strength to the so-called elastic limit of malleable is much higher than the same ratio in steel, should justify a much lower factor of safety in design than would be permissible in cast steel, as the allowable working stress of malleable iron is about 10 per cent higher than that of steel.

As an illustration we will assume that the ultimate strength of cast steel is 65,000 lb. per square inch and the elastic limit is quoted at 35,000 lb. per square inch. Many malleable plants to-day are producing iron with an average ultimate strength of 50,000 lb. per square inch, which, while lower than the ultimate strength of steel at 65,000 lb., still has an elastic limit of approximately 38,000 lb. per square inch or about 8 per cent higher than that of steel. Since in the design of castings it is the elastic limit and not the ultimate strength which is considered, it would seem that the facts, in connection with the superior soundness and freedom from blowholes of malleable castings, should be ample justification for using a lower factor of safety in arriving at the working stress to be used.

Malleable iron has greater rust-resisting properties than any of the other ferrous metals. Therefore, for use in railroad, implement and other work subjected to corrosion, it is to be preferred to cast steel or gray iron.

Our desire is to see a much-abused metal (chiefly so through the ignorance, or carelessness bordering upon dishonesty of too many of the producers of malleable iron) given its rightful position in the engineering world. An earnest hope is expressed that this paper may awaken an interest in producers of malleable iron castings which will tend to secure the highest possible quality in one of the most useful of the ferrous metals.

AMERICAN DIESEL ENGINES

Summary of the Different Types at Present Built in This Country

The following engines of the Diesel type are built at present in the United States, according to statistics presented by Max Rotter, chief engineer of the Busch-Sulzer Brothers-Diesel Engine Company, St. Louis, in a paper read at the recent International Engineering Congress at San Francisco. Although representative of the general development of this type of engine, in this country, several more or less known makes are not mentioned.

Snow oil engine, built by the Snow Steam Pump Works, Buffalo, N. Y. This engine is of the builder's own design, based upon its experience in the manufacture of large gas engines. The air compressor and scavenging pump are mounted on the side of the frame, and driven by a drag-crank on the end of the crankshaft. The regulation is accomplished by varying the stroke of the fuel pump plunger, by means of a sliding wedge, operated by the governor. This engine employs a modified type of open nozzle.

Allis-Chalmers oil engine, built by Allis-Chalmers Mfg. Company, Milwaukee, Wis. This engine is designed under the Lietzenmayer patents, using the open type of fuel nozzle of that name. The air-compressor is mounted on the side of the frame, and actuated from the crankshaft. The regulation is performed by varying the effective stroke of the fuel pump plunger, under governor control. A gravity oiling system, with filtering arrangements and pump, is used for all important bearings; the lubrication of the cylinders, and in special cases that of the exhaust valve stems also, is performed by a force-feed oil pump.

Four-cylinder, vertical, four-stroke-cycle Diesel-type oil engine built by McIntosh & Seymour Corporation, Auburn, N. Y. These engines are built in accordance with the designs of and under the sole rights to the U. S. patents of the Swedish Diesel Engine Company, Stockholm, Sweden. They use the Hesselmann patent fuel atomizer, in conjunction with the by-pass type of fuel regulation, under license from Busch-Sulzer Bros.-Diesel Engine Company. The air compressor forms a miniature A frame unit, directly coupled to one end of the crankshaft, and conforming in its general appearance with the working cylinders and their frames. The arrangement of air tanks is unique and has the object that the tanks may be manipulated from the engine platform, instead of, as is usual, from the floor.

Fulton-Tosi oil engine, built by Fulton Iron Works, St. Louis, Mo., under license from Franco Tosi, of Milan, Italy. The engine is of the A frame type, and employs the variable pump barrel volume type of fuel regulation, with governor controlled diaphragm.

Dow-Willans Diesel type oil engine, built by Dow Pump & Diesel Engine Company, Alameda, Cal., under license from Willans & Robinson, Rugby, England. This engine is of the A frame type, with a Reavell air compressor directly coupled to the end of its crankshaft.

Fulton Diesel-type oil engine, built by Fulton Mfg. Company, Erie, Pa. It is of the marine crankcase style, with a directly driven air-compressor, mounted upon the crankcase, symmetrically with the working cylinders. This company confines itself, the present time, to units of 100 hp. and under, of the full Diesel principle.

The Harris valveless engine, built by Southwark Foundry & Machine Company, Philadelphia, Pa., under the Harris patents. The engine is of the vertical, two-stroke cycle type, with stepped pistons performing the double function of scavenging pumps and low pressure stages of the air compressor, the intermediate and high pressure stages of which latter are arranged in line with the working cylinders.

The Diesel engine, built by Busch-Sulzer Bros.-Diesel Engine Company, St. Louis, Mo. This company is the continuation of the original Diesel Motor Company of America, in combination with Sulzer Brothers, Winterthur, Switzerland, and the late Dr. Diesel. The engine is of the four-cylinder, vertical, four-stroke cycle, enclosed crankcase type; with the air compressor directly driven from the crankshaft, and mounted on the crankcase symmetrically with the working cylinders. The engines are provided with positive pressure lubrication, the filter and cooler for which are placed in an accessible pit formed at the end of the foundation. The engine is provided with cam-operated compression relief, automatic compressor pressure regulation, automatic injection regulation, and piston cooling.

Cambria Loses Jones Mixer Case

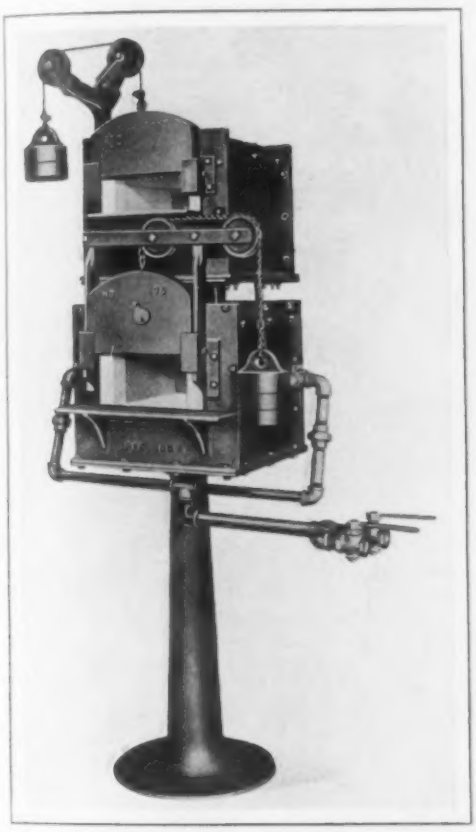
The United States Supreme Court, by its refusal to grant a writ of certiorari Nov. 8, decided finally that the Cambria Iron Company must pay the Carnegie Steel Company $568,305.93, with interest, from May 1, 1912, for the infringement of the Jones mixer patent used in making steel. This amount was allowed by the Third United States Circuit Court of Appeals. It was complained by the Carnegie Company that the defendant company had infringed on the Jones patent from Nov. 1, 1895, to Oct. 31, 1898. During this period the defendant company passed 520,188 tons of molten blast-furnace metal through the mixer and remelted in cupolas about the same quantity of blast-furnace iron. The Carnegie Company averred that there was a saving of over $1 per ton by the Cambria Company through the use of the Jones patent.

NEW HEAT-TREATING FURNACES

High-Speed Steel and Cyanide and Lead Hardening Outfits with Preheating Ovens

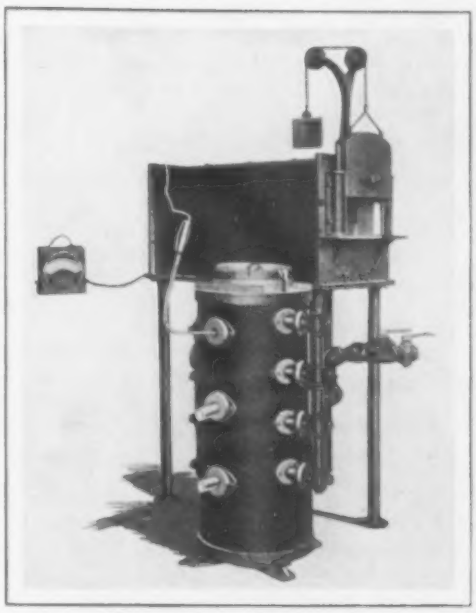
Several new types of furnaces for high-speed steel tool work and for cyanide and lead hardening, designed to save labor and fuel and to produce higher efficiency in heat-treating work have been brought out by the Bellevue Furnace Company, Detroit, Mich.

One of these is a gas furnace for high-speed steel, with a preheating oven, the exhaust heat from the high-speed steel oven being utlized for warming the preheating chamber. The preheating oven is located above the high-speed one, the exhaust heat from the latter being carried to the former by two clay tube outlets connecting the two chambers. The burners are located in grooves in the lining at the



A Gas-Heated Furnace for High-Speed Steels Equipped with a Preheating Oven Which Is Warmed by the Exhaust Heat from the Main Oven

sides of the hearth, so that the flame does not come in contact with the work. There is one inlet for gas and air which is used at low pressure. To get the best results high-speed steel is usually preheated, and in some shops where a furnace is not available for this work the hardener will take his steel to the opening of the high-speed chamber, where he will heat it to a cherry-red color and then place it in the high-heat chamber. This method requires considerable time and it is claimed does not always give good results. With a furnace of the type shown the hardener can place his steel in the upper chamber, where it is heated by the exhaust heat from the lower chamber and the final operation in the high-speed chamber can be done with a saving of time. With this furnace a number of pieces can be treated at a time. The high-speed furnace chamber is 9 in. wide, 12 in. deep and 7 in. high, but the furnace is furnished in a larger size with a chamber 11 in. wide and 18 in. deep.

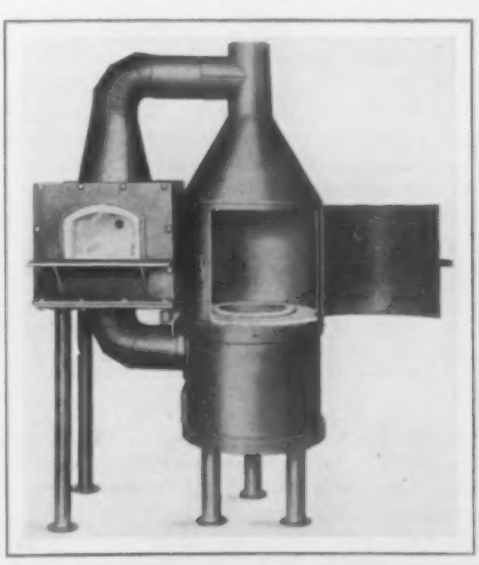


Vertical High-Speed Steel Furnace Having Pyrometer Holes to Enable the Heat in Any Section to be Determined

This furnace is designed particularly for hardening gears, milling cutters and other tools. It is stated that the high-speed chamber will heat up to 2250 deg. Fahr. in 15 or 20 min.

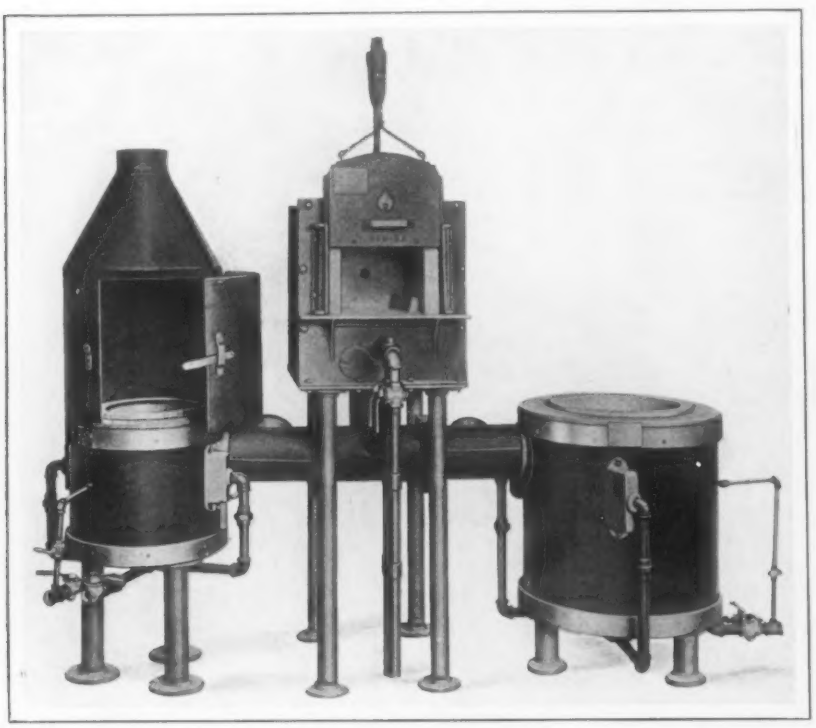
The vertical high-speed steel furnace shown, several of which were recently built for the Ford Motor Company, is another type that has been developed. This furnace is 36 in. deep and 7 in. in diameter. The preheating oven which is heated by the exhaust heat from the high-speed oven is 36 in. deep, 10 in. wide and 11 in. high. The vertical furnace is provided with three pyrometer holes so that a test for uniformity of heat can be made in any part of the furnace. It is stated that when the high-heat oven is at 2200 deg. Fahr. the temperature of the preheater is 1450 deg.

A combination gas or oil furnace for general tool work and cyanide and lead-hardening furnaces is also illustrated. The tool furnace is heated by the exhaust heat from either the lead or the cyanide pot or both. The heat passages from the lead and cyanide furnaces to the tool furnace are 5 in. in diameter, inside measure, and are clay lined. Outlets are provided so that when both the cyanide and the lead furnaces are in operation and the heat



Cyanide Furnace Using Gas or Oil as Fuel and Equipped with a Preheating Oven Heated by the Exhaust from the Furnace Proper

from only one of these is required to heat the tool furnace, the exhaust heat from either the cyanide or the lead furnace can be discharged outside by closing a damper and removing a cover to an opening in the pipe, allowing the escape of the heat at the back of the furnace. The tool furnace has an independent fuel connection and burners, as the illustration shows, so that it can be operated independently of the other two furnaces. The lead pot is 16 in. in diameter and 16 in. deep, the cyanide pot is 10 in. in diameter and 10 in. deep and the heating chamber of the tool furnace is 11 in. wide, 18 in. deep and 10 in. high. This furnace is not designed for heating high-speed steel, but it can be converted to high-speed steel work by adding additional burners. When not used as a preheater it can be used for heat treating carbon steel; the exhaust heat brings the temperature up to 1500 deg. or sufficiently high for carbon steel without the use of additional burners.



A Combination Oil or Gas Furnace for General Tool Work and Cyanide and Lead Hardening Furnaces, the Exhaust Heat from the Latter Pair Being Utilized to Heat the First

The last furnace is a gas or oil-fired cyanide furnace with a preheating oven, the exhaust heat from the cyanide furnace being utilized for heating the chamber of the preheating oven. It is claimed that with this furnace and with the combination type as described above, steel can be properly preheated before immersing in the bath, thus assuring a high production and keeping the cyanide or lead bath under more uniform temperature than would be the case were cold steel emerged in the bath.

It is stated that the quantity of merchandise to be shipped this winter from Seattle to Japan, China, Siberia, Hawaii and the Philippines will be limted only by the carrying capacity of the vessels available. It is also announced that the greatest fleet ever sent from the Puget Sound country to the lower Pacific coast in one month will depart from Seattle, Tacoma and Port Angeles this November. W. R. Grace & Co. have secured leases on six steam freighters and three sailing vessels, and each will be loaded to the limit with flour, wheat, canned salmon and lumber, so much in demand by the Pacific coast countries, but heretofore cut off by lack of available shipping.

Drinking Water for the Factory

Experience has indicated that water to be entirely palatable should not vary more than 5 deg. from 50 deg., according to R. F. Massa, in a contribution to the American Water Works Association. A drinking water supply for any large number of people should aim to encourage the use of a sufficient quantity by each person. To this end it should be made attractive by being kept pure up to the lips of the consumer, by being clear and sparkling, by being obtainable at attractive fountains conveniently placed, and by being regulated to the right temperature.

An average person drinks about 3½ pints of water per day, the rate of consumption being increased by heat and exercise. Bubbling fountains are more economical than cups. A properly designed bubbler will furnish the water in the form of a jet of such a height that most of it can conveniently be drunk without allowing the lips to come in contact with the orifice. It does not pay to cut down the size of the stream in order to eliminate waste, since with a small flow, time is wasted. Cleanliness and the appearance of cleanliness are essentials.

In general, mechanical cooling seems to be more economical than ice cooling, although it is difficult to obtain exact comparisons. Whatever the system, it should be absolutely clean. Surfaces in contact with the water should be smooth and accessible for cleaning; coils should be designed with that in view.

Only a limited area can be satisfactorily served from a single refrigerating unit, for the heat losses are so great as to demand too low a temperature for safety near the cooler in order to get palatable water at the end. The number of fountains is determined by the number of people to be served. In general, one fountain for every 100 persons is a fair average and the maximum should be 200 persons per fountain.

Good, cool water increases the efficiency of the workmen by improving their health; it reduces the number of absences; and particularly in summer it cuts down the number of heat prostrations. The indirect gain lies in the better attitude toward the company engendered by attention to the comfort of the employees and the consequent better efficiency, while related to this is the fact that comfortable working conditions attract a better class of employee.

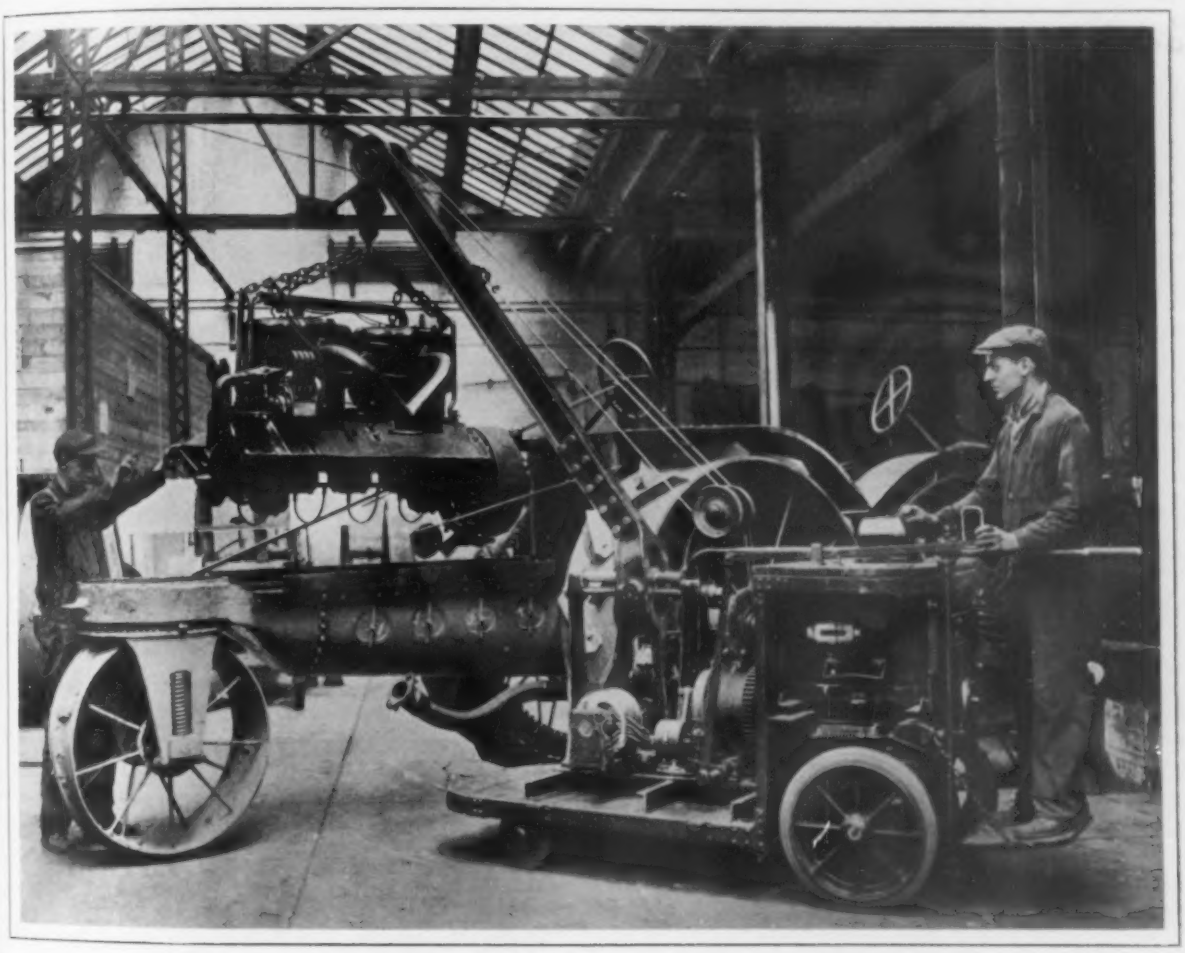
The C. & G. Cooper Company, Mount Vernon, Ohio, reports a considerable volume of engine business received recently, among which are a 13 x 30-in. simple direct connected Corliss engine for the Gilbert & Barker Mfg. Company, Springfield, Mass.; a 28 x 42-in. simple Corliss engine direct connected to a 500-kw. generator, for the Gleason Works, Rochester, N. Y.; a 44 and 74 x 54-in. tandem Corliss engine for the Carnegie Steel Company, Edgar Thomson Works, Bessemer, Pa. Another noteworthy order called for three 21½ x 36-in. single tandem gas-engine-driven compressors for the United Fuel Gas Company, for use in its station at Spencer, W. Va. The Cooper Company is also doing a large business in the building of special heavy machinery.

The Chicago Builders' Specialties Company has removed its offices to the fourteenth floor of the Lumber Exchange Building, 11 South La Salle Street, Chicago. In its warehouse at Fifteenth and Dearborn Streets, it is carrying a large stock of concrete mixers, metal lath, expanded metal, corner bead, channel iron, etc.

Crane-Equipped Storage Battery Truck

The Elwell-Parker Electric Company, Cleveland, Ohio, is equipping its storage battery truck which was illustrated in THE IRON AGE, July 3, 1913, with a crane. This enables loads up to 1000 lb. to be handled readily, the accompanying illustration showing the truck in use for placing the internal combustion engine in a tractor. Other uses to which the trucks may be put are the handling of heavy dies and other parts.

The boom and hoist are operated by an electric motor receiving its current from a storage battery mounted on the truck. This battery is of either the lead or the Edison nickel-iron type and also furnishes current to the motor propelling the truck.



A Storage Battery Truck Equipped with a Power Operated Crane Capable of Handling a Load of 1000 Lb.

Pressed steel is used for the frame while crucible drop forgings and alloy steels are used for the other parts, all of which are interchangeable as every piece is machined to gage or drilled to a jig. The motors employed are of the series wound type with protection against the entrance of water and dust, and three traveling speeds, both forward and reverse, are obtained through a drum controller. Provision is made to automatically open the main circuit and return the controller to the off position as well as set the brakes when the operator leaves his position at one end of the truck. A four-wheel steering device is used to give a short turning radius. An all-geared drive is employed to transmit power from the traveling motor to the wheels of the tractor, this being divided into two parts by the use of a countershaft.

The Bethlehem Steel Company will soon erect a commodious dispensary building at a cost of $40,000 for the benefit of its nearly 20,000 employees.

Standardization of Machine Safeguards

The desirability of a definte set of standard safeguards for machines and tools was referred to in a paper on "Safeguarding Machines and Tools," presented by James M. Woltz, safety director of the Youngstown Sheet & Tube Company, at the recent congress in Philadelphia of the National Safety Council. Some engineers, he said, prefer guards made of cast iron, some punched plates, some sheet metal, others wood, mesh or expanded metal. All these materials have their advocates, and likewise it is found that each has been condemned when used for certain specific purposes. Guard railings of all heights, weights and materials have been seen side by side in the same plant.

Mr. Woltz suggests that the heavy cast guards used on roll tables and other heavy machinery have in many instances the disadvantage of requiring a crane to handle them. The crane may be needed at another point at the same time, and this, of course, results in more or less delay in repair work, when the factor of haste in getting the plant in operation is highly important. A sheet metal guard, he considers, would in most instances do quite as well as the cast guards and the weight of the sheet guard would permit its being removed without the use of a crane. Whether a gear runs in oil and the amount of lubricant used is also a controlling factor in guarding. In other words, in designing guards and selecting the material from which they are made, it is well to weigh carefully the place they are to be used and the work they are to perform.

Edwin S. Griffiths, president Cleveland Machine & Mfg. Company, Cleveland, Ohio, has acquired a controlling interest in the Buckeye Engine Company, Salem, Ohio, which for the past fifteen months has been in the hands of a receiver. It is understood that the company's affairs will be straightened out shortly and that it will be taken out of the hands of the receiver and reorganization effected.

PRO-LABOR LEGISLATION

National Founders' President Discusses Also 8-hr. Day and Department of Commerce

The possibilities in the way of labor legislation, a brief discussion of the 8-hr. day and an attack on Secretary of Commerce Redfield marked the address of William H. Barr, president of the National Founders' Association, before the annual meeting of the association at the Hotel Astor, New York, Wednesday, Nov. 17. In part the address was as follows:

Perhaps the most vital project in which manufacturers will be obliged to assume the defensive is a practical change in the Federal constitution under the cloak of ostensible child labor bills. The attempt will be made to limit interstate commerce by specifying that trade be prohibited in any article of manufacture in which the labor of minors or women working more than 48 hr. per week enters.

The Clayton bill having proved disappointing to the American Federation of Labor, an effort will be made to introduce under another name the provisions of the infamous Pearre bill which even Congress refused to pass. The bill in effect provides, as heretofore, that no injunction shall issue except to protect property or a property right. That may appear comparatively fair, but the bill further defines what is a property right, and states that the right to carry on business at a certain place, or in a certain manner, or at all, shall not be considered a property right. The strikers might respect your physical property because of the power of an injunction, but your business itself, your right to do business, your good-will, and, in fact, everything you possess in the world, might be destroyed under the terms of this bill.

The American Federation of Labor will again demand that no appropriations be made which can be used in shops in which an efficiency system is in force. Congress will, of course, again bow to labor when the sundry civil bill comes up, and a clause is inserted providing that none of the funds assigned to the Department of Justice shall be used to prosecute labor organizations. President Taft once vetoed that section and President Wilson apologized when he signed it the first time, but there is danger of his forming the habit, and again signing it, without apology. Another attempt will undoubtedly be made to pass the immigration bill which President Wilson vetoed, and which Congress was afraid to repass over his veto.

An effort is likely to be made to enact legislation which will practically instruct the Interstate Commerce Commission to enforce full crew legislation on all interstate roads. Other bills which will probably be pressed by labor will be an appeal to prohibit railroads from transporting strikebreakers, an act creating a bureau of labor safety under the charge of the Secretary of Labor, the domestic convict labor bill, the foreign convict labor bill and two or three others which are still under consideration by the Federation.

Members should assist in an effort to demand a recall of the uneconomic seamen's bill, the destructive influence of which has already thrown Government bureaus into confusion and has substantially annihilated the transoceanic commerce under the United States flag. The law has threatened foreign complications, in that the President must give notice of the termination of all treaties which conflict with our plan for the treatment of undisciplined crews. In addition, far from being the boon to organized labor that was intended, it has been a positive detriment by causing the discharge of many able seamen formerly employed by navigation companies who have been compelled either to reduce their interests or retire from business.

Above everything, we must immediately insist on corrective legislation bringing labor unions definitely within control of the Federal anti-trust laws. The necessity for such enactment is actually felt by the public when five great brotherhoods of railroad employees unite in a nation-wide co-operative agreement, which might, should any demand, however ridiculous, be refused, result in paralysis to the nation's traffic, bankruptcy of our railroads, or vastly higher charges to the public. The move is the most gigantic and daring ever attempted by labor unions.

BUSINESS AS REPRESENTED IN CABINET

Last year, when the effect of the tariff was being felt and before the war had begun to neutralize it, the manufacturers of Montgomery County, Pa., petitioned the President to take some action which would prevent the destruction of their industries, and the petition was referred to Secretary Redfield. The verdict returned was that the manufacturers of Montgomery County did not know their business, that they were incompetent to conduct the industries which they had built up, and that if they were driven out of industry it was their own fault.

Men who have paid attention to the economic condition which will exist after the war have been frightened by the possibilities involved and the certainty of a wholesale dumping of cheap European goods in our markets. Even the President of the United States is concerned. Not so the Secretary of Commerce.

THE 8-HR. DAY AGITATION

As Commissioner McClintock's report will indicate, we have had comparative quiet in strike conditions throughout the year, for as yet our association has not been obliged to face, except in a preparatory fashion, the very grave situation which has been thrust upon the National Metal Trades Association. The demand for early delivery of war materials in large quantities created a stimulated condition in many, but by no means all, metal trade plants, and gave union agitators a long-sought-for opportunity of demanding in certain localities both increased wages and the 8-hr. day.

The condition is especially grave, not so much because of union demands, as that manufacturers themselves have not a thorough understanding of the fundamental economics involved and too frequently grasp at temporary profits without thought of the future, or the application of the golden rule in relation to brother producers.

The uneconomic 8-hr. day in the foundry industry will arrive only when this association declares for it. It is for you, and you only, to decide. As an association, we should vigorously oppose this wholesale holdup of business by union agitators in an attempt to force unfair conditions which could not normally be obtained, and which if gained can only result in lasting harm to the industry by a manifest inability, later on, to compete successfully for foreign trade.

RETURNS TO LABOR AND CAPITAL

Most appropriately, I am privileged to comment favorably on the recent report of the National Civic Federation, showing in a new light the comparative returns to capital and labor in manufactured products. This report completely destroys the fallacy that labor does not receive its proportionate share of the income from industry. As a matter of fact, it is clearly shown by comparative statistics that labor actually does receive the lion's share, or 77 per cent of the income.

A CODE OF FOUNDRY RULES

In the past year there has been adopted and published, under the direction of the Labor Bureau of the State of New York, a set of foundry rules which has been unanimously approved by a joint committee of foundrymen and molders. These foundrymen, to whom we owe a debt of gratitude for their conscientious committee work during a trying period, were, with one exception, members of our association, and it is their combined judgment that there is nothing in these rules to which fair-minded foundrymen can possibly object.

The resulting State bulletin has been used as a foundation for similar legislative interpretation in other States, particularly Pennsylvania and Ohio, and it may be safely used as a basis for the revision of rules governing the foundries of any State. This is another of the constructive means which members of this association are continually developing for the purpose of modifying, or eliminating causes of unrest in the foundry.

The development and study of our problems could be distinctly aided through local foundrymen's organizations working hand in hand with our own and other national associations. Lectures by experts in various kinds of foundry appliances may be followed by open and frank discussion of shop practice. At the same time, plans for closer working relations between employers and their employees for mutual advantage; careful understanding of local legislative proposals and sectional labor situations; insistence on installation of safety devices and the establishing of better working conditions, will further demonstrate the unquestioned value of employers' co-operation.

Your committee on safety and sanitation has exhaustively studied many subjects embraced under that head, and has offered proof of its labors in the presentation of the first handbook on this subject ever published. It is a tribute to the able and enthusiastic efforts of Mr. Alexander and his associates, Messrs. Angus, Corbin, Hallowell and Macdonald.

The Resharpening of Files

Although for a number of years attempts at file sharpening have been made, it is only within the last few years that the process has become a commercial success. E. R. Norris, in his paper "Machine Shop Equipment, Methods and Processes" at the International Engineering Congress, describes the operation as follows:

A sand blasting apparatus is being used with success for file sharpening, by several large manufacturing establishments. This apparatus consists of a sheet-iron chamber provided with uptake, settling tank, slurry mixing-tank, slurry overflow-pipe, air agitating pipe and slurry projector. A door gives access to the inside of the chamber. The slurry projector is inclined to the horizontal at an angle of 25 deg., and the nozzle extends slightly within the chamber. This projector consists essentially of a bronze body to which are fitted steam pipe, slurry suction-pipe and nozzle. The steam supplies sufficient water for the slurry.

The files are sharpened by being held in the slurry jet in such a manner as to expose the backs of the file teeth to the cutting action of the sand. After the file has been sharpened, it is cleaned and dried by the steam, after the slurry supply has been cut off by a foot lever.

Success in file sharpening depends on the skillful selection of the files to be sharpened, maintenance of the correct angle between files and jet while sharpening, and the selection of a suitable sand. Experience shows that a sharpened file often does as much work as a new one, and the cost of sharpening averages about one-fifth of the cost of new files. The following results have been obtained under ordinary manufacturing conditions and may be taken as representative of the economies which are effected by the efficient use of this apparatus.

No. of Files Treated	Size, In.	Total Cost Sand Blasting	Recut Price	Price of New Files
109	4	$0.88	....	$11.99
1245	6	9.96	....	136.95
1332	8	14.20	....	199.95
943	10	15.07	$56.00	169.74
1266	12	28.98	96.48	241.20
831	14	26.69	99.72	174.51
566	16	22.64	90.56	124.52
142	18	6.28	27.17	34.32

The Killen-Strait Mfg. Company, Appleton, Wis., has booked a large order for Strait gasoline tractors for use in European military operations. The order calls for the delivery of thirty to thirty-five tractors a month for an indefinite period. Only part of the order can be filled at Appleton, and the company is arranging with outside manufacturers to build the remainder.

The Illinois Manufacturers' Association has called a conference of manufacturers to meet in Chicago Dec. 7, at 10 a. m., at the Congress Hotel, to consider united action on tariff legislation. All organizations of manufacturers have been invited to send delegates, and the invitation is being extended to individual manufacturers and industrial houses.

German Output in One Year of War

Germany's pig-iron and steel output has nearly doubled since the war started. The daily output rate was about twice, for July, 1915, what it was for August, 1914. The following table is based on official corrected data, given out by the Association of German Iron and Steel Producers, published in *Stahl und Eisen:*

Output for First Year of War

	Steel		Pig Iron	
1914	Total Output, Metric Tons	Daily Rate, Metric Tons	Total Output, Metric Tons	Daily Rate, Metric Tons
Aug.	566,822	21,031	586,661	18,923
Sept.	663,223	25,509	580,087	19,336
Oct.	900,201	33,340	729,822	23,543
Nov.	900,026	37,501	788,956	26,299
Dec.	941,399	37,656	854,186	27,576
1915				
Jan.	963,790	38,551	874,133	28,198
Feb.	946,191	39,008	803,623	28,701
Mar.	1,098,311	40,677	938,438	30,272
April	1,012,334	42,180	938,679	31,289
May	1,044,107	43,500	985,968	31,805
June	1,080,786	41,568	989,877	32,999
July	1,138,651	42,172	1,064,899	34,352
Total for first year of war..	11,355,841	.....	10,135,319	.....
July, 1914.	1,644,648	60,913	1,561,944	50,385

Output in August and September, 1915

Aug.	1,157,692	44,527	1,050,610	33,890
Sept.	1,174,350*	45,176	1,033,078	34,435
Year, 1913.	18,958,819	.....	19,309,172	.....

*Not official.

These corrected figures differ somewhat from those published from month to month in THE IRON AGE. It will be seen that while the daily output of steel fell in August, 1914, from 60,913 tons in July to 21,031, it has now more than doubled as the war progressed to 42,172 tons in July, 1915. In pig iron the daily rate fell from 50,385 tons in July, 1914, to 18,923 in August, but had risen to 34,352 tons in July, 1915. The production of steel and pig iron for the first year of the war is at least two-thirds of the 1914 production, a normal year, 1913 being the record one for Germany.

The output of steel, except in the first month of hostilities, has exceeded that of pig iron each month. Production of both steel and iron in July, 1915, was 70 per cent of that in July, 1914.

It will be interesting to note to what extent recent reported operations of British submarines in the Baltic sea, in sinking German ore-laden boats, may curtail this advancing output. Production figures for August and September, also included in the table, show continued increase. The effect of possible restricted imports of Swedish hematite ore on the German iron industry may not be felt for some time as in some quarters it is thought that these operations have been started too late, for Germany has for many months been importing Swedish ore as fast as mines could turn it out.

Sweden's Iron and Steel Output in 1914

Official statistics, now available, of Sweden's 1914 iron and steel production give a total iron-ore output, including bog ore and concentrates, of 6,588,300 metric tons, against 7,479,393 tons in 1913. The pig-iron production in 1914 was 639,718 tons against 730,257 tons in 1913, the record year. Of this, 39,055 tons of pig iron and ferroalloys came from one electric furnace. Of the total 147 blast furnaces, 116 were operating in 1914. The total 1914 production of steel ingots and castings was 507,332 tons compared with 590,887 tons in 1913, also a record. Electric furnace ingots were 2778 tons and electric furnace castings, 258 tons. The output last year of finished and semi-finished steel was 378,923 tons, of which 94,101 tons were exported, against an output in 1913 of 426,204 tons, with 140,975 tons exported.

The Swedish State Railway management has purchased from Germany very recently 20,000 tons of coal briquettes and 72,000 tons of coke for locomotive fuel. Mixing about equal proportions of coke and coal briquettes has been a success, especially in Denmark.

Iron Carburization by Blast-Furnace Gas

How Mild Steel and Electrolytic and Wrought Iron Are Highly Carburized by These Gases at Low Temperatures—The Effect of Sulphur

A paper which created considerable interest at the autumn meeting of the Iron and Steel Institution in London, England, in September, was presented by T. H. Byrom of London, entitled: "Note on the Carburization of Iron at Low Temperatures in Blast Furnace Gases." By a number of the well known metallurgists present it was regarded as an important contribution from both a practical and a theoretical viewpoint. An abstract of the paper as well as a few of the points brought out by the discussion are here given:

MILD STEEL CARBURIZED

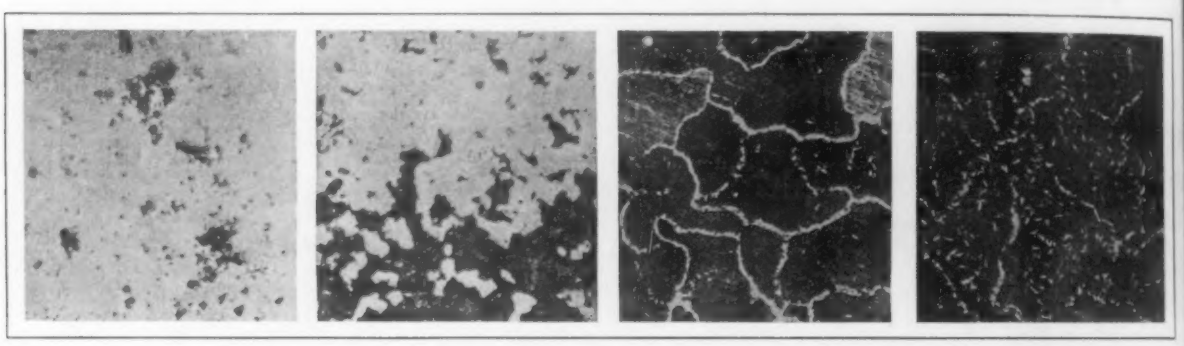
Toward the end of 1912 and during the process of cleaning and repairing tubes conveying blast-furnace gases, the author's attention was called to an extremely brittle plate which had been removed from the tubes. On inquiry it was found that it had been broken out of the center of what was originally a soft steel sheet, 7/16 in. thick, which had been placed in the flue to divert the stream of gas through a dust-catcher. It was only the central portion that was brittle, and as the surrounding parts were good the plate was patched and replaced in the same position. The plate had been exposed to the hot furnace gas for several years, at a temperature probably not exceeding 500 deg. C. The fracture of the piece somewhat resembled that of very high carbon tool steel, but was not so metallically lustrous. As the material was evidently of unusual interest, and had been formed under such peculiar conditions, the author communicated with Dr. Stead, and forwarded specimens to him.

The analysis of the brittle portion of the plate after removing the dust from the surface, was as follows:

	Per Cent	Probable Analysis of Steel, Per Cent
Iron	89.600	.....
Carbon	7.60	0.15
Manganese	0.25	0.27
Silicon	Trace	Trace
Sulphur	0.55	0.050
Nitrogen	0.012	.....
Phosphorus	0.030	0.033
Not determined	1.958	.....
	100.00	.....
Specific gravity		6.56
Specific gravity of soft steel		7.80

From the analysis it is evident that the steel had been completely converted into carbide of iron. Figs. 1 and 2 show the structure. The specific gravity compared with the original steel indicates that during carburization 100 volumes of the steel had expanded to 119—an increase of nearly 20 per cent. As the thickness was not increased, the expansion must have been lateral. That this had taken place was proved by the buckling of the plate in places beyond the brittle area.

When a piece of the cemented plate was placed in water, streams of bubbles ascended from the surface, indicating porosity. It was very hard and brittle, could not be cut with a saw and was reduced to fine powder in a steel-crushing mortar. The powder was practically insoluble in dilute sulphuric acid and hydrochloric acid. After treatment with these acids, about 2 per cent soluble matter was removed and the residue, after washing with water and alcohol, and drying, contained on analysis:



Figs. 1 and 2 (Two Left Photomicrographs) Show the Structure of 7/16-In. Steel Plate After Several Years' Exposure to Hot Blast-Furnace Gas. Fig. 1 is completely carburized, in which the white parts are carbide of iron and the dark parts porosities. Fig. 2 is partially carburized, in which the white portions are carbide of iron and the dark, porosities and ferrite. Figs. 3 and 4, the two right photomicrographs, show electrolytic iron carburized in blast-furnace gas, showing intergranular and intercleavage formations of carbide of iron. The white parts are carbide of iron and the dark, pure iron

	Per Cent	Portion Magnetically Separated, Per Cent
Total carbon	7.35	7.42
Amorphous carbon	0.16	Trace
Carbon combined	7.19	7.42

The high carbon in this residue suggested the presence of a mixture of carbides. From further experiments it would appear that the carbides were a mixture and not a simple carbide.

CARBURIZATION OF ELECTROLYTIC IRON

As this is the first time on record, as far as is known, of carburization being effected by hot blast-furnace gases, experiments were made at Middlesbrough by Dr. Stead, and at Wigan by the author, to find out whether iron could be readily carburized by the gases from the blast furnace, and at what rate carburization could be effected. Strips of pure electro-deposited iron were suspended by iron wire in the gas flues of furnaces at Wigan and Middlesbrough. The strips were about 0.015 in. in thickness. In about one week they became quite brittle and in a fortnight many of them broke away and were lost. The same results were obtained at both Wigan and Middlesbrough.

On careful examination of the pieces by Dr. Stead, after exposure for a fortnight, it was found that the iron was covered or sheathed by readily detachable layers of carbide of iron, which had

been formed on each side, while in the center there was a more or less exceedingly thin malleable sheet, which on bending broke readily at the boundaries of the crystals. The separated crystals were exceedingly ductile, proving that they had not been converted into carbide. Figs. 2 and 3 show the condition of the electrolytic iron after carburization. The following are typical analyses:

	Outer Layers, Per Cent	Whole Section, Per Cent
Carbon	6.96	2.10

THE EFFECT ON WROUGHT IRON

The pieces of electrolytic iron at Middlesbrough were suspended by impure wrought-iron wire rods, about ¼ in. in diameter. When removed, the specimens, where the temperature was 400 deg. C., were not in the slightest degree carburized, but in other places, where the temperature varied between 550 deg. and 650 deg. C., the carburization was most pronounced. The wrought-iron rods were also carburized, and what is most remarkable, the carbide in isolated particles had formed in the center as well as on the outside. Figs. 5 and 6 are photomicrographs of portions of the wrought iron. From the results obtained Dr. Stead was satisfied that

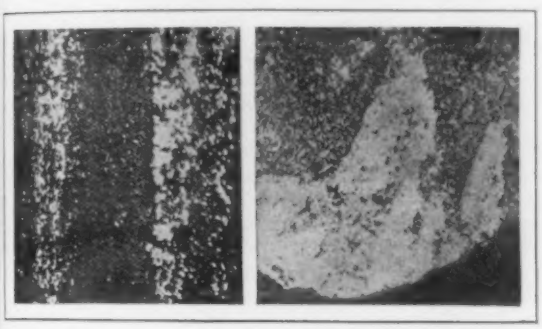


Fig. 5 (Left) is the Outside Part and Fig. 6 (Right) the Central Part of Impure Wrought Iron, Partially Carburized in Blast Furnace Gas. The portions lowest in phosphorus are carburized the most. Carbide of iron in seams is shown in one photomicrograph

the carburization was due to carbon monoxide alone, and that the action becomes slower the higher the amount of carbon dioxide present and the lower the temperature. On that account iron is not carburized in the flues of Cleveland blast furnaces, as the temperature is relatively low and the CO_2 is high. The reaction is not simple, and varies with the temperature. Analyses of the blast-furnace gases were as follows:

	Each Making Ferromanganese— Wigan, Per Cent	—Middlesbrough— Per Cent	Per Cent
N	60.50	60.50	61.00
CO	34.20	34.00	30.50
CO_2	3.00	3.00	6.50
H_2	2.30	2.50	2.00
	100.00	100.00	100.00

The appearance of the layers of carbide which formed on the electrolytic iron was identical with that of the completely carburized plate. After thorough cleaning it was found to be pure carbide of iron (Fe_3C), as was proved by an analysis by Dr. Stead, which yielded: Iron, 93.23 per cent; carbon, 6.67 per cent.

The center of the electrolytic iron, after exposure for a fortnight, contained intercrystalline deposits of pure carbide. In the specimen exposed for one month the central parts still contained crystals of iron, as in the previous example, surrounded by envelopes of carbide, but in addition carbide plates between the cleavages of the iron crystals, results which suggest that the carburizing gas passed most readily between the crystals and less so along the cleavages.

In the trials with electrolytic iron at Wigan, in addition to the marked carburization, many of the strips, after exposure to the gases, were thickly coated with a layer of pulverulent matter, remarkable for the large quantity of ferrous sulphide it contained. Analysis of this material showed: Sulphur, 14.40 per cent; iron, 23 per cent.

EFFECT OF SULPHUR IN THE GASES

These interesting observations led to the conclusion that the sulphides found on the iron must have been produced by the action of sulphur contained in the gases, on the iron, but in what state the sulphur existed in the gases, has not yet been determined. It is highly probable that it was sulphur vapor. The sulphates on the outer layer must have been produced by oxidation after the strips were removed from the flues and exposed to the air.

ACTION ON A STEEL LADDER AND INGOT IRON

A similar carburizing action to that already described was also noticed in the case of a steel ladder which was fixed inside a dust catcher in such a position as to be exposed to the hot gases and dust for about seven months. An average analysis of the whole substance gave:

	Per Cent
Combined carbon	3.44
Graphite	Trace
Silicon	0.09
Sulphur	0.70
Phosphorus	0.03
Manganese	0.29

A similar result to the above was obtained by Dr. Stead in Middlesbrough, who exposed a bar of Armco pure iron for a month in the flue of one of the Middlesbrough blast furnaces making ferromanganese. The metal, which contained not more than 0.02 per cent of combined carbon originally, was found to have 6.6 per cent carbon in its porous envelope after the treatment and 1.5 per cent carbon in the central part.

The Discussion

Dr. J. E. Stead, referring to the statement in the paper regarding an experiment on a piece of very pure Armco iron, said that this was placed in a furnace in Middlesbrough as described in the paper and after withdrawing and keeping for a little time, the outer layer, essentially consisting of carbide of iron in a very spongy condition, was distinctly rusted throughout its mass and on striking the bar with a hammer the outside layers broke away, leaving the central core intact. The central core, although carburized, had not broken up in the same way as the outside. It could be seen at once that it was impossible to form carbide of iron or carbides of iron on the outside of a piece of iron without causing considerable expansion and that expanded material, of course, was liable to film off or break away from the bar itself. This paper was only the beginning of a very much more elaborate research.

DESTRUCTION OF BLAST FURNACE BELLS

T. E. Holgate said that he had had considerable experience with ferromanganese gases and his impression had been that expansion due to the action of the gases was considerably greater than the 20 per cent which the author had found. It had given rise to great difficulties. For instance it rapidly destroyed the bells. As the expansion took place around their edge cracks developed and the bell was destroyed in a comparatively short time. For that reason he had been endeavoring, but so far without success, to construct a furnace top with a double bell or a very close top arrangement. He had not succeeded because of this action of the iron

which, being immersed in the gases, was not cooled by exposure to the air. Was it certain that all the carbon, 9.45 per cent, was actually combined with the iron and the iron still maintained its metallic character? He had been under the impression that this expanded and carburized material more or less lost its metallic character.

The presence of the sulphur and sulphides was very interesting. He had not suspected it before, but evidently it had an action in destroying the iron work exposed to the hot gases. It evidently persisted at a certain temperature which was not reached in ordinary blast furnaces, but which was encountered more in furnaces dealing with special material.

E. H. Saniter, who had done a great deal of work in connection with Fe_3C, said he had never been able to obtain it in the mass like this. It was an extarordinary thing that at this definite temperature it was possible to get Fe_3C in mass, nominally 100 per cent Fe_3C. The question of the bells referred to by the previous speaker was rather a different matter. The temperature there was much higher and it was not a question of the formation of Fe_3C, but a question of the oxidization and carbon deposition. Referring to the extraordinary feature of the sulphur coming out of the blast furnace, it had always been his impression that the whole of the sulphur came out of the slag notch of the blast furnace. That it should come out of the top in the ferromanganese furnace where all the conditions were favorable to its being eliminated through the slag notch, seemed to him very extraordinary indeed.

Prof. H. C. H. Carpenter said the facts established in this paper were of very high importance and value. It was shown quite clearly that mild steel, wrought iron and electrolytic iron in blast furnace gases at temperatures from about 550 to 650 deg. could, with sufficient time, be converted wholly into carbide of iron. It was rather interesting that the composition of the carbides was not quite the same in the case of mild steel as it was in the case of electrolytic iron.

THEORETICAL IMPORTANCE OF THE SUBJECT

In spite of the practical interest of the paper he ventured to think that its theoretical importance was even greater. Nearly all the diagrams of the iron carbon system regarded the iron and free carbon in the form of graphite as a stable system. Dr. Guettler, in his enormous monograph on the subject, went so far as to say that iron-carbide was meta stable at all temperatures. It appeared to him that if these experiments were right—and he did not question them because they were going to be very important—and if it was possible to form iron-carbide directly as it was formed in this case from iron and carbon-monoxide, and if it would persist for several years, then it could not be said that that was meta stable. It appeared to him that in this range of temperature between at any rate 550 and 650 degrees we must regard iron-carbide as the stable phase.

If the results in the present paper were right—and it seemed to him that they were incontestible, then we must regard the iron-carbide as the stable phase. That was the profound and tremendous importance of this paper. The author had not touched upon it, but it appeared to him to be so important that he ventured to emphasize it.

Dr. Rosenhain said he agreed with Dr. Stead and Professor Carpenter that this paper was one of very far-reaching importance. Its theoretical importance would be at least as great, if not greater, than its practical value, but he was not quite at one with Professor Carpenter in his interpretation of what the theoretical meaning really was. Professor Carpenter had been commendably cautious in regard to the iron-carbon diagram. That caution it would be well to continue a little longer. The theoretical meaning turned on the question of what was meant by the meta stable phase.

Before we could really accept the view as conclusively established that iron carbide could be formed at these low temperatures, relatively, the experiment would have to be repeated with pure carbon monoxide and pure iron. He believed that this had been tried repeatedly and failed every time. Therefore, he felt inclined to ascribe the present action to catalytic intervention of other substances, and possibly the presence temporarily or permanently of other phases, which complicated the whole business very much.

THE REPLIES OF THE AUTHOR

Mr. Byrom, replying to Mr. Holgate as to blast-furnace bells, said he had noticed on many occasions a kind of nodular growth on these bells and the ultimate destruction of the bells as such owing to rottenness. He agreed with Mr. Saniter that it was not so much a question of the formation of carbide as oxidation, and deposition of graphitic carbon. He remembered examining deposits from a bell in which there was undoubtedly a large proportion of graphite and the graphite on the blast-furnace bells was not regular; it was nodular and quite irregular. The same speaker had raised the question as to whether the carbide in this material which was formed in the blast-furnace gases was combined. His reply was that it was practically all as carbide. It did not retain its metallic character, but became very hard and brittle, so much so that it could be crushed in a hard steel mortar which of course the original material could not. With regard to the question of sulphur, raised by Mr. Saniter, there was in his opinion a very decided action going on due to sulphur either as free sulphur or some sulphur compound. As Mr. Saniter had said, most people anticipated that the sulphur was eliminated either in the slag or the metal. He had no doubt that he had seen free sulphur deposited from blast-furnace gases, and it was most remarkable how it came about, especially in ferromanganese production, where one would expect that the sulphur would be eliminated either in the slag or in the metal. This all tended to prove that there was a possibility at any rate of the action of carbon-oxy-sulphide. That was a point which had appealed to him in the investigation and he had been disappointed on looking up the text books on the subject to find the information on carbon-oxy-sulphide was very limited. The properties of that compound needed investigation.

The theoretical point introduced by Professor Carpenter opened a very wide field for research. He must admit that it opened a wider field than he had anticipated. The discussion of the theories Professor Carpenter had brought forward as to the meta-stability of carbides it would be unwise for him to say very much about at the present time without making further investigation. Dr. Hatfield had spoken of the cementation process, and the fact that it was only possible to impart say 1.9 per cent of carbon to the material. In the cementation process the material in contact with the iron that was to be converted into steel was carbon. It was not in a gaseous condition originally, although theoretically it was assumed that carbon monoxide was produced. In the case of these blast furnace gases he took it the reaction must be due to carbonic oxide either itself or through the agency of some catalytic agent. The point had been raised whether pure carbonic oxide or pure iron would re-act forming this carbide. He did not think it would. There might be some catalytic action going on which was peculiar to blast furnace gases, and which enabled this reaction to complete the whole mass of material into carbide of iron. That peculiar agent, whatever it was in the blast furnace gas, enabled that action to go on, and if that catalytic agent was not present he did not think the reaction would be obtained.

The American Steel Foundries is now operating three open-hearth furnaces in its plant at Granite City, Ill., and will start another shortly. The addition of two emergency furnaces within the next few weeks is also contemplated. The Commonwealth Steel Company, also at Granite City, is working full time as is the Granite City Steel Company, both with orders enough to carry them through the winter. The Helmbacher Forge & Rolling Mill Company's plant is being overhauled and is to be put in operation to full capacity Jan. 1. The American Car & Foundry Company's plant at Madison, Ill., is running to capacity, said to be largely on foreign business.

THE AUTOMATIC MACHINE

When and When Not to Use Machines of Four Different Types

Automatic machinery in the metal working trades formed the subject of a paper presented at the International Engineering Congress at San Francisco by Ralph E. Flanders, manager of the Jones & Lamson Machine Company, Springfield, Vt. Considering the term "automatic" in the restricted sense in which it is used in American shop practice, viz., a machine of the lathe family, these machines have passed through the following stages of design:

1. The hand-operated engine lathe; 2. The hand-operated turret lathe or screw machine; 3. The single-spindle automatic turret lathe or screw machine; 4. The multiple-spindle automatic. Each of these types of machines is employed in the best modern practice. The respective fields in which they are most economically employed may be outlined about as follows:

THE ENGINE LATHE

The engine lathe, used for most special work in small quantities, for experimental work and tool making, and in general, for non-repetition work. In some cases it is profitably employed for quantity manufacturing, using special tool holders, etc. Most large firms engaged in the manufacture of light- and medium-weight machinery should get along with a surprisingly small proportion of engine lathes in their equipment.

HAND-OPERATED TURRET LATHE

The hand-operated turret lathe and screw machine form a step in advance of the engine lathe, as they provide means for a multiplicity of tools permanently set and operating against positive stops. They are thus able to duplicate complicated cutting operations on a series of pieces with great accuracy. The hand screw machine on small bar work is handicapped by the greater proportion of idle movements and handling time to cutting time. Continuous activity without rest periods would be required to keep up with the automatic. But on work held in the chuck, particularly where turning operations are required, the automatic has not been developed to the point where it can compete on small work, and the small hand screw machine or turret lathe is consequently holding its own in this field.

AUTOMATIC TURRET LATHE OR SCREW MACHINE

In larger sizes of turret lathes the conditions are different. In the first place, the idle movements of the larger automatics can seldom be made any more rapidly than they can be made by hand, and the cuts are usually long enough so that the operator has periods of rest, even when pushing the machine to its limit.

The strong point of the hand turret lathe is intensive production. Constant supervision and the opportunity for instantaneous changes of feeds and speeds make it possible to keep these up to the highest pitch, while the automatic must work at a slower rate as an insurance against trouble. The hand machine also costs less, as a usual thing, and does not require so large an expense in special tooling. Thus the hand-operated machine offers not only a greater output per machine, but a greater output for the capital invested as well. This includes floor space and other property changes, as well as the charge against the machine itself. Contrasting the automatic with this, Mr. Flanders says:

> The automatic often offers a reduction in labor cost that more than offsets the increase in overhead charges which it incurs. And there are sometimes conditions of the labor market such that the automatic is used even where the total cost of its product is known to be somewhat higher. It is undoubtedly true that there are many cases of hand turret lathes being used when automatics would be more economical, and there are certainly a great many cases when the reverse is true also. The merits of any particular case must be decided by the exercise of unusually good judgment; or, better, by a study of costs which takes the overhead charges into account as well as the labor cost. In this connection it may be noted that the manufacturing cost of high-grade machinery is usually made up of about one-third direct labor, one-third material, and the other third overhead charges of various kinds. Of these three items, that of material is not greatly affected by the style of machine used. In large work the hand machine tends to reduce the overhead charge, while the automatic machine tends to reduce the direct labor charge.

MULTIPLE-SPINDLE AUTOMATIC SCREW MACHINE

The multiple-spindle automatic screw machine is now firmly established, and capable designers are continually extending its field into more complicated and more accurate work. It also has a definite relation to the economics of manufacture. Concerning this phase Mr. Flanders says:

> If there is demand enough for an article to support large establishments for its manufacture, and if there are no patent or other restrictions to keep its manufacture in the hands of men of limited ability, the normal tendency is toward quantity manufacture. The cheapening of production by using automatic machinery on large lots is an important factor in this tendency.
>
> If the article of manufacture can be standardized, so that the design changes little from year to year, the advantages of large scale manufacture are still more apparent. Machines can be kept on one piece continuously day and night, if necessary, until worn out. Operators can be trained to great skill, not only in getting large output for the comparatively few pieces or operations in their repertoire, but in getting a high grade of workmanship as well, where that is necessary. Special machines, each built for one operation only on a single piece of work, can be profitably used.
>
> Such a manufacturing system also has its disadvantages. The most obvious of these are the necessity for keeping the product free from change so far as possible; and, also, the monotonous character of the work from the operator's standpoint. Of course, no industry is fit for large-scale, intensive manufacture until the product is fairly well standardized; or at least until the particular design selected for manufacture is such that it will suit a large percentage of possible customers. To increase the field of customers, such an establishment is in a position to offer attractive low prices for its standardized output, in place of the frequent novelties and special features offered by the smaller manufacturers.
>
> There is also something to be said for such an establishment from the standpoint of the workman. An immense amount of ability, of the highest order, must go into its management; and its organization furnishes opportunities for many such men. On the other hand, for workmen of faithfulness and dexterity but small originality, it can and ought to furnish work at higher wages than they could obtain in any other employment. Many skilled workmen, as well, find these high wages a compensation for the monotony of continuous work on one piece.

Industries large enough to be organized on the high production basis may be made practically free from the competition of smaller firms, if the product can be standardized. And this method of manufacture at the same time offers the opportunity of good wages to the mechanic, and low cost to the consumer.

Motion picture films to advertise Bolivia's industries are now available for presentation before business men of the United States. They are shown under the auspices of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, Washington, D. C., through the courtesy of the Bolivian Minister at Washington. It is probable that local organizations desirous of having the films can ascertain the conditions by writing to the Bureau.

Purchasing Supplies for the Panama Canal*

Methods Used to Insure That the Government Receives Exactly What It Pays For —Precautions to Have Deliveries on Time

BY F. C. BOGGS†

The supplies used at Panama may be divided into two general classes: Construction supplies and subsistence supplies. The second class includes such articles as eatables, clothing, shoes, toilet necessaries, etc. The first class includes construction material and tools and equipment of all kinds needed in the actual work on the Canal. With a few exceptions all items of the first class were bought through the purchasing department of the Isthmian Canal Commission in Washington. Those of the second class were handled through a department of the Panama Railroad in New York and are not considered in this discussion. The system of supply is practically the same now as during the life of the Isthmian Canal Commission. For convenience therefore the official designations formerly in force will be used throughout this paper.

REQUISITIONS

Requisitions were submitted in the usual way. Such items as could be supplied from stock were turned over to the division submitting the requisition. Items that could not be so supplied, and items needed to keep up the general stock, were consolidated in requisitions which, after the approval of the chairman and chief engineer, were mailed to the purchasing office of the Commission in Washington. When received in Washington the requisitions were separated, those calling for proprietary articles, or supplies urgently needed, going to the "open market" desk, while those which included articles not urgently needed were sent to the "advertising" desk.

At the open market desk items were again divided. To cover proprietary or repair articles, and articles urgently needed or of small value, letters requesting prices and guaranteed deliveries were sent to the maker specified, or to a manufacturer who had satisfactorily furnished the same supplies previously. For other items similar letters were sent to two or more firms, depending on the urgency, the value and the nature of the article.

At the advertising desk the various items were classified and prepared for printed or mimeographed circulars. These circulars gave full information to the bidder, all data relative to general requirements, methods of payment, etc., being inserted on the front page or in the contract form which formed a part of each circular, while the specifications relative to the particular article followed each class. Blank spaces were left for insertion by the bidder of unit and total prices and for the name of the maker of the article and the place of manufacture. The bidder was also requested to insert, in space left therefor, the guaranteed time of delivery at the Isthmus.

ADVERTISING

Under the law any article whose estimated value was over $10,000 was required, except in emergencies, to be advertised in newspapers, while for articles under $10,000 and over $1,000 it was sufficient to advertise by sending out circular letters or notices, and by posting such notices in a public place. For articles the value of which was under $1,000 no special legislation had been provided, and they could have been bought without advertising or circular letters if desired. In case of emergency, advertising of any kind could be waived, subject, however, to the approval of the Secretary of War in the case of articles of which the value was in excess of $10,000.

Under the system adopted, however, competition was sought wherever practicable, irrespective of the price, the object being to obtain a satisfactory article at the lowest possible figure. As previously indicated, circular letters were sent to a limited number of such firms as experience indicated were in a position to supply what was needed at reasonable prices. Printed and mimeographed circulars were, however, sent to all firms who were listed in the Washington Office as handling the various articles included. These circulars were also sent to board of trade and Government offices throughout the country. Information relative to items desired was also printed in the *Government Advertiser*, and advertisements were inserted in various newspapers. In this manner the widest publicity was given.

AWARDS

The bids on all circulars and practically all circular letters were opened publicly on a certain specified date and hour. Interested bidders were permitted to be present at the opening, at which time bids were read and recorded on an abstract. One copy of all bids was available for reference by representatives of the contractors or others who had a bona fide reason for investigating them. In some cases certain data were made confidential and were not shown to other bidders, as, for example, when a bidder submitted a design which had not yet been patented. These cases were, however, infrequent. Information relative to materials needed by the Isthmian Canal Commission was published in the *Government Advertiser*, and full data relative to all awards appeared in the same paper.

The joint resolution of Congress, approved June 25, 1906, provided as follows:

> That purchases of material and equipment for use in the construction of the Panama Canal shall be restricted to articles of domestic production and manufacture, from the lowest responsible bidder, unless the President shall, in any case, deem the bids or tenders therefor to be extortionate or unreasonable.

The proper interpretation of the above involves the understanding that award should be made to the lowest responsible bidder for the material called for. If the low bidder were known not to be responsible, or had given repeated unsatisfactory service, it has been construed that the law did not compel award to such a bidder. Also if a bidder modifies the specifications, and quotes on some article not called for by the Isthmian Canal Commission, it can hardly be reasoned that Congress intended an award should be made to him.

In handling awards under any particular item, the abstract was consulted and the low bid was referred to. If this low bid was satisfactory in all respects, no further investigation was made, the theory being that certain material was asked for under certain specifications, and that, except in unusual cases, the Government would not be warranted in purchasing at a higher price other material, although the more expensive material might be better than that specified. This theory of course does not hold where the award depends on the samples or specifications to be submitted by the bidder, in which case the Isthmian Canal Commission always reserved the right to make such award as was deemed to the best interests of the Government.

The total prices are not always a proper indication of the relative order of the bidders, since in submitting bids one bidder might figure the total weight of a certain article to be greater or less than another bidder. In cases of this kind the unit prices were generally held to govern and award was made accordingly.

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*From a paper presented at the International Engineering Congress, San Francisco, Sept. 20-25, 1915.

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The subject of permitting changes in bids after the same were opened was one which was frequently raised by bidders. The rule adopted was that no change was permitted in any bid, and if the prices were reasonable no additional bids were asked for. This rule was maintained rigidly in connection with all items of a bid which might be considered as affecting the price. For example, if the earliest possible delivery was asked for, and the statement was made that early delivery was essential and would be considered in making the award, or if we asked for delivery on a certain date, this delivery was considered an essential part of the bid and no change was permitted after the opening. If on the other hand, no special comment was made relative to the urgency of the delivery, bidders were sometimes permitted to modify their deliveries.

At times this rule seemed to work a hardship on the Government, as we were occasionally compelled to accept a higher price, where the low bidder would probably have shortened his time. However, in the long run it is felt that the Government benefited, as, if bidders were authorized to change essential items in their bids, there would have been no assurance that their first bids were based on the best price and deliveries, whereas, after the rule became known, bidders were aware of the fact that if they wished to obtain the business, they must submit the lowest possible price and least time in their original tender.

FOREIGN MATERIAL

It may be of interest to insert here the rule which was adopted under the Isthmian Canal Commission to govern purchase of foreign material.

In interpreting the latter part of the joint resolution of Congress quoted above, the final instructions issued by the President under date of March 2, 1909, were as follows:

> The White House, Washington, March 2, 1909.
> To The General Purchasing Officer,
> Isthmian Canal Commission.
>
> The following executive instructions in furtherance of Joint Resolution No. 35 of June 25, 1906 (34 Stat. L., 835), will hereafter control in comparing bids for materials to be used in connection with construction of the Isthmian Canal and in determining awards thereon.
>
> When bids which are submitted on materials of foreign production are lower than on material of domestic production and manufacture, preference will be given to the article of domestic production and manufacture, unless the bid for the latter exceeds the former by an amount equal to the duty on the imported article. Where an article of domestic manufacture is made up, in part, of imported ingredients or components, the presence of such components will be ignored, if the duty has been paid. If, however, the article is manufactured in bond, or if the bid is based on a drawback being paid or allowed, the amount of such duty or drawback should be similarly considered in making the award.
>
> THEODORE ROOSEVELT.

It is noted, however, that this executive order was merely a general rule for the guidance of the purchasing officer of the Isthmian Canal Commission, and it did not bind the President to accept a bid on foreign material under the conditions laid down, for, if he felt that a bid on domestic material, even though it might be greater than the foreign bid plus the duty, was still not exorbitant, he would under the joint resolution have been required to direct that the award should go to the domestic concern.

CONTRACTS

As soon as items were awarded, the formal order was prepared, either in the form of a written contract in cases where the amounts were in excess of $10,000, or in the form of an order. These order forms referred to the terms of the specifications and included such additional data as were necessary for the proper supplying and shipping of the material. With each order a set of shipping instructions was inclosed to the contractor, giving him definite information as to how material should be shipped, what papers should be forwarded to various destinations, etc.

INSPECTIONS

One copy of every order was forwarded to the inspecting engineer who was at the head of the inspecting department, which department was directly under the general purchasing officer. The order form, when received, was carefully noted by the inspecting engineer or by one of his assistants, and a short form was filled out making notation of the various papers, specifications, drawings, etc., which would be needed in handling the inspection of the order, so that when the material was reported as ready, no time was wasted in getting together the papers. Frequently this investigation developed uncertain points which, if they had arisen later, might have delayed the furnishing of the material.

The inspecting engineer, on the receipt of this order form, immediately sent to the contractor a form letter asking to be advised when and where the material would be ready for inspection. On receipt of reply to this letter all the necessary papers were sent to our nearest inspector, with instructions to keep in touch with the contractor and make the inspection on the date specified. The inspector, if he found the material satisfactory, filled out and gave the contractor authority to ship material, one copy of this authority being forwarded to the inspecting engineer and another copy being forwarded to one of our agents at the seaport through which the material would be shipped, in order that he might keep track of the material and see that it went forward promptly.

It has always been a rule to allow our inspectors very small latitude in the matter of departures from specifications, and any such departures were immediately reported to the inspecting engineer, to be passed on by him, or by the general purchasing officer. In this way we were reasonably sure that inspections of similar material from different parts of the country were being handled in exactly the same manner.

In certain cases, before shipment was authorized, it was necessary to have samples of material analyzed or subjected to certain physical tests. Samples were not taken until the material was prepared for shipment, when taken, the containers were sealed by our inspector and properly marked so that there would be no danger of the substitution of other material. These samples, having been taken by our inspector, were forwarded either to Washington for analysis and test by one of the technical Government bureaus, or to Pittsburgh, where we maintained a small laboratory of our own. As soon as the samples were reported on the contractor was notified to make shipment, if the result was satisfactory; or he was advised of the rejection of the material, if the result was not satisfactory. In either case a printed form was filled out and the information as to the acceptance or rejection was furnished to the contractor and to the authorities on the Isthmus, so that they might know the status of the particular order. Each inspection was covered by the inspector in a report, which merely consisted in his filling out certain blanks replying to certain printed questions, which were indicated on the report form. These answers included all the data which were necessary to adjudicate the order finally and were found preferable to the ordinary typewritten report, from which essential data were frequently omitted.

In connection with the inspections by the Isthmian Canal Commission, it was found necessary, as work proceeded, to build up quite a large inspection force, the members of which were directly employed by the Isthmian Canal Commission and were under the supervision of the inspecting engineer. In addition to these inspectors, who were stationed at various large cities throughout the country, the Isthmian Canal Commission was authorized to ask the various district engineer officers of the United States Army to handle small inspections, and the assistance given by this branch of the service was material in permitting prompt handling of orders. The Isthmian Canal Commission has also worked in close harmony with the various technical branches of the Government. A large proportion of our analytical tests and a great many of our physical tests were made by the Bureau of Standards, the Bureau of Chemistry, and the Bureau of Mines. Frequent expert assistance was also given by the Bureau of Forestry and the Bureau of Plant In-

dustry. The work of these departments is of the highest grade. If a rejection based on the report of one of the bureaus was complained of by the contractor, he was always given the privilege of consulting the particular bureau from which the report originated. There are very few, if any, instances on file where the contractor did not finally accept the report of the Bureau and indicate his belief that the work of the Bureau could not be questioned. As one instance of the assistance given by the Bureau of Standards, it is noted that all the technical work in the inspection and testing of the cement furnished to the Panama Canal was done under the direction of this bureau. As the shipments of cement at one time amounted to 7000 barrels per day, and the total amount of cement furnished was approximately 6,500,000 barrels, it can readily be seen that the work involved was of no light character.

The system just described has reference to the usual inspections covering ordinary supplies. In connection with large contracts, which required considerable time for execution and involved a special form for the inspection work at shops and mills, a slightly different system was followed. In these cases the work was assigned to an assistant engineer who reported either direct to the general purchasing officer or to the authorities on the Isthmus. This assistant engineer was in charge of the local work of inspection and had under him such inspectors as were needed, such assistance of course being rendered by the regular inspecting force under the inspecting engineer as could be given from time to time. Some of the works carried on under these special inspecting forces were the inspection of the lock gates, the emergency dams, the electrical installations on the Isthmus and the sea-going dredges and other large floating equipment. It is noted, however, that the bulk of the work fell directly under the inspecting engineer.

FOLLOW-UP SYSTEM

When an order was placed a copy of this order was sent to the follow-up or "punching" desk. On receipt of this copy it was examined, the date of delivery called for was noted, and the urgency, and the character of the material were taken into account.

Based on these a note was made at an advanced date in a diary kept for that purpose, to look up the order referred to. When the date arrived the order was examined, the status was determined and the contractor, in case circumstances seemed to warrant, was requested to expedite the work. A note was again made on a further advanced date and the order was again called up at that time. In this way every urgent order was closely followed and every effort was made to expedite delivery.

The set of orders designated for this room was kept on file there, and as the shipping papers were received, notations were made on the orders to indicate what parts of the material had gone forward. When the order was completed this copy was transferred from the active file to the completed file, and it was therefore possible at any time by reference to the active file, to find out exactly how many orders were still outstanding and what amount of material had been shipped on each one.

RECORD ROOM

The system of filing and keeping track of the records was not in accordance with modern ideas, but, in view of the peculiar circumstances, was found perfectly satisfactory. All requisitions received from the Isthmus bore a certain number. So far as correspondence with the Isthmus was concerned, any item mentioned in that requisition was always referred to by the requisition number and the item number thereon. Until a particular item of a requisition was included in a printed circular or was covered by an order, all papers relative to that particular item were filed on the requisition file. As soon as the item was placed in a circular a file bearing the circular number was started, and, until an order was placed, the circular number and class number of the item were generally referred to. When the item was covered by an order, all correspondence bore as a file record the order number. There were, in addition to correspondence in connection with items requisitioned for from the Isthmus, a great many letters and documents which bore no particular reference in requisition, circular or order number. These were filed in miscellaneous files with cross-index cards. A card record of various contractors and orders placed on them was kept in the file room as well as a card record of all orders covering any particular class of material. These card records were as brief as possible and any special information was obtained by referring to the file itself.

All through the work an attempt was made to keep every one advised of the status of the various orders, and also, by reference to various offices interested, to check the orders as placed and to make sure that there were no errors. The following system was adopted: A copy of the requisition prepared on the Isthmus was forwarded to the division on the Isthmus whose requisition had been consolidated therein. If any error was noted in the consolidation it was the duty of the division making the original requisition to call attention promptly to it. On receipt of the requisitions in the United States the various items and specifications were carefully noted by the proper clerk, and, if any discrepancy was discovered which could be rectified in the Washington Office, it was promptly done, and the authorities on the Isthmus were notified of the action taken. If the discrepancies were of such a nature that there was considerable doubt as to what was desired, the matter was referred to the authorities on the Isthmus, either by letter or by cable as the urgency demanded. On the issuance of a circular or on the issuance of a letter asking for prices, a copy of such circular or letter was immediately sent to the authorities on the Isthmus. Likewise when an order was placed, two copies of the same were forwarded to the chief quartermaster, one copy being placed on his file and the other copy being referred to the division which made the original requisition. This order was checked with the original requisition and any errors were promptly reported.

On the first day of each month a report was submitted to the authorities on the Isthmus indicating what items, on requisitions received up to the beginning of the second preceding month, had not as yet been ordered. This statement was checked by the authorities on the Isthmus and in this way assurance was given that no items had been overlooked.

In the Washington office the original requisition was placed in a separate binder, and, as the orders were placed, a notation of the order number was made against the particular item on the requisition. As the original requisitions were completed they were carefully examined for omissions, were removed from the active file, and placed in separate binders in the file room.

FORMS

Throughout the work it was found that the adoption of form letters and reports was very convenient, and it is possible that, in the opinion of persons dealing with the Panama Canal, these forms may have been increased beyond any reasonable amount. The great advantage is that there is no danger of omitting information which is desired, and there is, moreover, no reason for including extraneous and unnecessary data. These forms have been found extremely valuable in the work and have materially assisted in the proper handling thereof.

As a substitute for hand or pole shifting of belts from one step of a cone pulley to another, the Alexander & Cox Company, 2358 Ogden Avenue, Chicago, has placed a new belt shifting device on the market. The vertical rod of the device has a telescopic automatic adjustment to accommodate it to the height of the ceiling, thus doing away with the necessity for accurate measurements when fitting to the cone pulleys of a given machine. A clamping arrangement allows the shifter loop and the vertical tube to be held in any position.

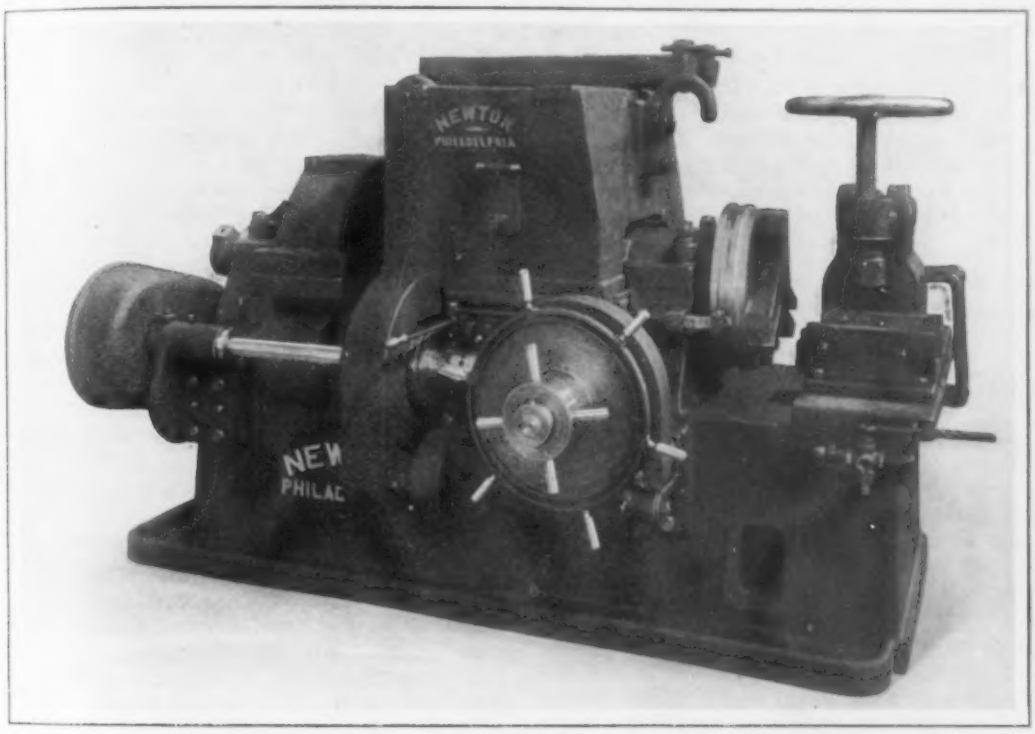
Machine for Cutting Rail Ends

For use in conjunction with machines for drilling the splice bar holes in high-carbon, high-manganese, open-hearth rails as made to-day, the Newton Machine Tool Works, Inc., Philadelphia, Pa., has developed a rail ending machine. Lifting hooks are provided to enable the machine to be transported from one fixed position to another to take care of different lengths of rails or conditions of rail shipping departments.

The machine is motor driven, the motor being mounted on the top of the machine and transmitting power through a 10-in. belt to a hardened steel worm of steep lead. This worm meshes with a phosphor bronze wormwheel that is double keyed to the spindle. Capped bearings fitted with bronze bushings to compensate for wear are employed. The spindle has a hand controlled forward movement of 2¾ in. and an adjustable automatic stop with safety limits that are relied upon to prevent the spindle from jamming at either end is provided as well as power quick return. The feed is by a stationary screw and revolving nut, the thrust being taken by inclosed ball bearings 8 in. in diameter. There are four feed changes ranging in arithmetic progression from 1/64 to 1/16 in. per revolution of the cutter head which rotates at from 5 to 15 r.p.m. The cutter head, which is of the three-tool type and is intended for use either with solid cutters or with tool holders, has a diameter twice that of the spindle.

The rail is clamped in a chuck which is fitted with hardened serrated plates and has the mouth bevelled in all directions to provide for easy entrance of the rail. The clamp is of the builder's patented clearance air-operated type, providing a clamping pressure of 32 tons, the operating valve being located at the front of the machine directly below the clamp. A handwheel is provided for the adjusting screw on the clamp to take care of the various sections of rail placed in the machine.

All of the gears are entirely inclosed and the main driving and feed gears run in oil. A circulating pump and distribution system are provided to take care of cooling the tools and the pan around the base receives the surplus cooling compound. Cored openings are provided in the base for the removal of the chips which fall down out of the way as soon as they are produced.



A Machine Employing a Three-Tool Head for Cutting Off the Ends of Open-Hearth Steel Rails

Pressed Steel Wheel for Factory Trucks

A new pressed steel wheel that is unusually light in weight but designed to have the strength of a much heavier wheel has been brought out by the W. J. Clark Company, Salem, Ohio. It is made in various sizes and can be used for different types of trucks where light duty work is required. The special feature of the wheel is a peculiar folding of the web to form the channel part to which the rubber tire is attached. This is double thick and the web at the base of the tire has four thicknesses. The circles shown near the rim are holes cut in the web to reduce the weight and to improve the appearance.

It is stated that the ornamentation in the raised work of the web provides the same rigidity with No. 18 gage steel as would be secured with No. 16 gage without the raised ornamental work, and that the wheel is about 7 lb. lighter than a similar plain wheel. It is furnished with either plain or ball axle bearings, either type being renewable. It has a renewable rubber tire with a round fac..

A Rubber-Tired Factory Truck Wheel Pressed from No. 18 Gage Steel

Electric Steel Direct from Ore Fines

Converting Refractory Ores into Pig Steel in an Electric Shaft Furnace Using Natural Draft—The Metallurgical Possibilities and Uniform Product

BY A. C. DALTON

In a recent paper the statement was made: "The electric furnace will have realized its highest attainment when it is employed directly for making pig steel from iron ore. Already this has been demonstrated as a possibility in Sweden." It will be of interest to many to know that the same possibility is being demonstrated on the American continent, along somewhat new lines, which promise to be equally successful.

I described in THE IRON AGE of Oct. 15, 1914, the Moffat electric furnace at the Moffat-Irving Steel Works, Ltd., Toronto, Canada, for treating fine ores, without subjecting them to any mechanical treatment other than concentration, briquetting or sintering. The process was then described in detail with the results of some experiments on flue dust. The flue dust was from hematite practice and was easily reducible, but as the results were very promising, much interest was naturally shown as to what success would be met with in the treatment of the more refractory iron ores.

Table 1—Details of the Charges of the Heats with Consumption of Electricity

Heat	Duration of Heat Hr.	Min.	Ore	Coal	Limestone	Recovery, Per Cent	Kw. Hr. Per Lb. of Metal in Ore
A	2	50	1,000	150	65	68.00	1.015
B	4	15	1,600	270	100	70.00	1.34
C	2	25	1,000	250	200	44.20	1.02
D	3	55	1,000	280	210	72.60	1.70
E	3	40	1,000	200	75	....	1.47
F	4	30	1,000	280	210	67.50	1.14
G	4	00	1,600	350	210	88.20	1.23
H	3	00	850	142	150	85.80	1.25
I	3	10	1,000	188	184	90.40	1.27
J	3	05	1,000	200	175	84.50	1.32
K	3	35	1,000	275	200	97.10	1.36

SMELTING MOOSE MOUNTAIN MAGNETITES

A suitable opportunity occurred for a series of trial runs with the Moose Mountain magnetites. The results are of considerable metallurgical interest. The figures here given are only of an experimental nature and with the exception of heats D, E and F are from intermittent runs. Local circumstances prevented continuous runs, which would have improved considerably many of the figures in Table 1. It is also necessary to remember that in this process there is no solid body of materials in the furnace, the ore along with the fuel and flux being all showered in some 13 ft. above the level of the bath.

Table 2—Analysis of the Pig Steel

Heat	Combined Carbon, Per Cent	Silicon, Per Cent	Sulphur, Per Cent	Phosphorus, Per Cent	Manganese, Per Cent
A	0.12	0.06	0.121	0.015	0.08
B	0.06	0.03	0.07	0.017	0.07
C	0.70	0.02	0.054	0.013	0.13
D	0.06	0.04	0.085	0.015	0.01
E	0.06	0.04	0.119	0.019	0.02
F	0.05	0.05	0.088	0.016	0.02
G	1.18	0.06	0.109	0.012	0.06
H	0.10	0.02	0.062	0.009	Trace
I	0.06	0.03	0.073	0.007	0.02
J	0.04	0.06	0.086	0.005	Trace
K	1.36	0.04	0.151	0.018	0.18

In the treatment of the fine materials by such a process as this the question naturally arises: Is there not a high mechanical loss due to the fines being carried up the stack by the ascending gases? While no direct method has yet been employed to estimate this, the quantity that so escapes is practically negligible under normal conditions. This is accounted for by the fact that no forced air is put into the furnace; only natural draft is used. This is further substantiated by the high percentage of recovery it is possible to obtain under good conditions, as shown in Table 1, when heat K gave 97.1 per cent total recovery of the iron charged.

The practice in detail is much the same as described for the flue dust experiments in the article referred to, the chief alteration being that anthracite coal screenings have been substituted for the coke breeze for these reasons: The lower sulphur content of the coal and better reduction with anthracite. The other alteration was the replacing of limestone for lime, because this allowed of much better feeding control.

Owing to the fact that much of the Moose Mountain magnetite is so intimately banded with silicious materials, the ore has to be crushed to a considerable degree of fineness for concentration purposes, the concentrates for these experiments being exceptionally fine, 200 mesh. The figures for the electricity consumption are the high tension readings and they therefore include all transformer losses, etc., which are normally 10 per cent and this should be clearly understood. In the tables will be found the analyses of the materials used and of the pig steel produced as well as slags. Table 1 gives the details of the charge with the electricity consumption in k.w. hr. per pound of metal in the ore charged.

Table 3—Analysis of the Slags

Heat	SiO_2, Per Cent	FeO, Per Cent	Al_2O_3 Per Cent	CaO, Per Cent	MgO, Per Cent
A	17.52	33.94	13.16	19.21	....
B	20.04	49.31	5.36	19.66	5.25
C	30.12	14.90	9.40	27.19	....
D	20.80	27.77	9.97	15.18	26.24
E	23.60	19.58	9.84	21.84	21.14
F	19.20	46.11	5.13	11.46	15.04
G	34.90	10.93	12.33	35.29	8.90
H	28.40	18.21	5.65	30.45	....
I	17.20	50.09	7.03	19.18	....
J	22.00	40.54	5.31	24.42	....
K	34.20	8.67	11.50	36.81	....

METALLURGICAL POSSIBILITIES

The more important phases of the process are the metallurgical possibility and the uniform control of the product. It is now generally accepted that the final deoxidation of iron ores is done by the solid carbon. It was necessary therefore in this process to keep the fuel of sufficient coarseness and excess so that some of the carbon should reach the bath in the solid form. Further experiments were made where the proportion of carbon was considerably increased and decreased, and it is interesting to notice the effect of this procedure in the percentage of carbon in the steel and the increase of the FeO in the slag. These figures tend to confirm the experience of other investigators that the lower the carbon content of the pig steel, the higher will be the ferrous oxide in the slag.

There is danger in having too large an excess of carbon as was pointed out by Professor Rich-

ards some time ago, when he said: "That in electric melting one danger was an excess of carbon. Since no air is blown into the furnace any excess above that consumed in the reduction must remain unused, accumulate and eventually clog the furnace." He then advocated the use of a tuyere to deliver excess air as this would always be responsible for a given amount of carbon. It would not be advisable, however, to introduce air under pressure in this process, but the same result was obtained with complete satisfaction using natural draft. As the furnace allows observations of the bath to be frequently taken it is easy to regulate the amount of carbon feed if any undue excess occurs.

In the treatment of fines by such a process there will always be a higher percentage of FeO in the slags owing to the ore being in such a finely divided nature. This of course will be somewhat modified with perfect control of the slag which will be one of greater difficulty than in ordinary reduction furnaces. This control of the slag is finely balanced with the physical conditions and unless the two are working in correct proportions erratic results will be obtained. Heat E is an example where this occurs. The coal charged was considerably less yet the carbon remained practically the same as in heats D and F. The deficiency of lime is clearly seen in the rapid rise of the sulphur in the steel. A thin, hot, fluid slag of course is the secret of the process and fortunately the furnace allows of such variation in its feeding device that almost instant effect can be produced on the bath.

Table 4—Analyses of Raw Materials

Moose Mountain Concentrates		Limestone		Coal Screenings	
SiO_2	8.20	SiO_2	0.98	Ash	17.40
FeO	23.01	FeO Al_2O_3	0.29	Sulphur	0.75
Fe_2O_3	55.68	S.	Trace	F. Carbon	72.10
Al_2O_3	2.19	P.	Trace	Vol. Matter	10.00
CaO	Trace	$CaCO_3$	97.69		
MgO	0.10	$MgCO_3$	1.36		
SO_3	Trace				
P_2O_5	0.49				
TiO_2	Trace				

UNIFORMITY OF THE STEELS

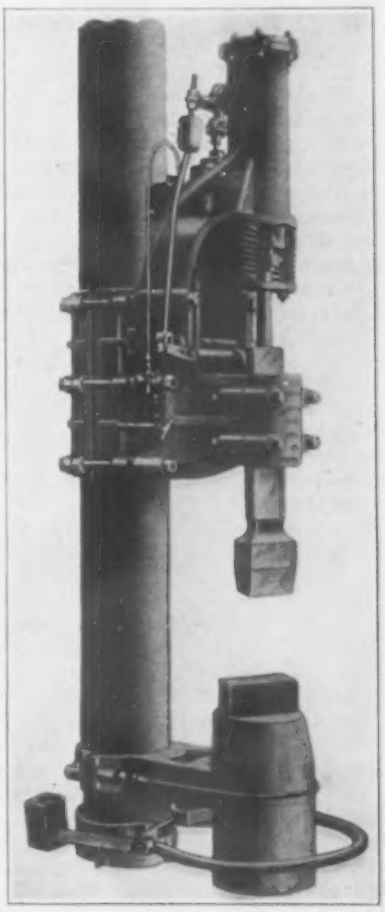
In spite of this it is interesting to see how comparatively uniform are the analyses of the steels produced, where no attempt at uniformity was made except in heats D, E and F. These three heats were run consecutively and it is noticeable that the electricity falls as the furnace gets hotter. The high consumption in the first heat was due to a thick heavy slag caused by the action on the furnace bottom. The recovery is not as good as would have been expected, but was due in this case to some of the metal not being poured owing to the action on the furnace bottom. In other cases the low recovery is explained by the fact that a lot of the fines were adhering to the walls of the hearth and were partially reduced. This, in continuous running, would obviously be lessened.

Sufficient has been done with these preliminary runs to satisfactorily demonstrate the metallurgical possibilities of such a process in the treatment of ore fines. Owing to these experiments being of an intermittent nature, it is inadvisable to publish any data as to the costs, but there is sufficient reason to believe that the final costs will be within commercial limits and some further experiments of a more extensive nature are about to be undertaken, with a view to establishing the commercial standing of the process. Any such data should necessarily be held until the results of this future work are completed.

The results obtained by this process at present show that such refractory ores as magnetites in an extremely fine state of division can be smelted without first being subjected to any other treatment than concentration and that there will be no difficulty in producing a high grade pig steel of uniform composition.

Pneumatic Hammer of the Post Type

A hammer particularly intended for drawing down the short pieces of tool steel that were formerly scrapped has been placed on the market by the Q M S Company, 2059 Elston Avenue, Chicago, Ill. This hammer is of the post type, and can be operated by steam or compressed air. It can, of course, be used for all classes of light forging.



Post Hammer Operated by Steam or Compressed Air for Drawing Down Short Pieces of Tool Steel

The steam or compressed air is admitted through a special valve movement which is relied upon to give perfect control. The force of the blow is regulated by the foot treadle, which is pressed all the way down when it is desired to have the ram strike a hard, full blow similar to that given by a drop hammer. By pressing the treadle down only part of the way a series of hard or light blows is secured, the variation in intensity corresponding to the distance through which the treadle is moved.

The Canadian Duty on Forgings

A duty of 32½ per cent is imposed on shell forgings entering Canada from the United States. Up to the present it has been deemed wise by the Canadian Government not to remove the tariff, as some twelve Canadian companies have been turning out forgings at a rate sufficient to supply the needs of other manufacturers who merely finish shells. Since the recent distribution of shell orders by the Munitions Committee at Ottawa it is considered advisable in some quarters to have the duty removed, on the ground that the output of shells in Canada would be increased by the importation of forgings from the United States.

It is announced from Ottawa that the Munitions Committee has fixed the price of steel for ammunition to be made in Canada. It must not exceed 3½c. per pound.

The State Workmen's Insurance Board of Pennsylvania, which will work in conjunction with the new workmen's compensation law, effective Jan. 1, has announced that it will make a reduction of 10 per cent from the approved rates in the insurance rate manual of liability insurance companies, and that the minimum premium will be $5.

THE PROPOSED MUNITIONS TAX

Its Revenue Possibilities Are Large—Other Objects of Taxation

WASHINGTON, D. C., Nov. 16, 1915.—No announcement in connection with the Administration's plans for raising additional revenue to meet the Treasury shortage and the anticipated additional expenditures on account of the national defense has aroused anything like the interest awakened by the statement that the Treasury Department has begun a canvass of munitions factories to determine the practicability of imposing a tax on war material manufactured for foreign governments. It is believed the proposition will have a great deal of support in Congress.

The first question that has arisen in the preparation of the schedules covering munitions factories is, what is war material? The officials have not hesitated to enumerate in this classification field and naval guns, powder, fuses, shells, shrapnel, small arms and fixed ammunition. These articles are all finished products, but it is a well-known fact that enormous quantities of material intended for the manufacture of munitions are now being exported, in some cases by the same establishments that are shipping the finished articles. Billets, bars, etc., intended for the manufacture of shells and shrapnel, gun forgings and many other crude forms that are ultimately used in the manufacture of munitions are not in themselves war material and it is conceivable that in some cases the manufacturers or sellers thereof have no positive knowledge that they will ever be used for such purposes. Enormous quantities of barb wire have been shipped every month since the war began, but while it is assumed that this material is intended to be used by the European armies for the construction of entanglements, it is understood that there is nothing in the contracts or specifications covering these purchases to indicate the use to which the wire is to be put. In some cases extra barbs are called for, but this specification is not conclusive. It is understood to be the intention of the authorities to treat as war material all submarines, motorboats, etc., made in this country for use by the belligerents and shipped out of the country in sections.

It may be assumed that before the inquiry now on foot is finished war material manufacturers will be called upon for copies of their contracts and for all other information in their possession with regard to the character and destination of their products. It goes without saying that in many cases such information will be very meager, but the officials are preparing to follow up all data thus received in the hope of identifying in one way or another all munitions actually exported.

A perplexing question is whether subcontractors as well as contractors producing war material shall be taxed. In the case of articles subject to internal revenue taxes it is the uniform practice of the bureau to require the tax to be paid before the goods leave the factory, but the application of this rule to war material would undoubtedly result frequently in imposing a heavy tax upon a subcontractor whose profits are very small, while the contractor would be called upon to bear no part of the burden although his profits might be very large. However, in time all new contracts would undoubtedly be made on the basis of tax-paid goods, the foreign purchaser paying a corresponding advance. The probable productivity of a munitions tax during the coming year or two renders the plan very tempting to Treasury officials who are in quest of at least $200,000,000 additional revenue, which they hope to derive without having recourse to any tariff legislation except the restoration of the sugar duty. That such a tax will be opposed by certain members of both houses quite as strenuously as it will be advocated by others is certain. Already Senator Underwood of Alabama, formerly Chairman of the Ways and Means Committee, and himself interested in a company producing pig iron in the Birmingham district, has stated in effect that the output of that district includes absolutely nothing in the way of war material. This is taken as notice that Mr. Underwood does not intend that the Birmingham iron and steel producers shall be called upon to pay a tax. As it is probable that a very large quantity of Southern iron has found its way into war material of one form or another, and large steel rounds for shrapnel are being rolled at the Ensley steel works, it would appear to be Mr. Underwood's view that nothing but the finished product shall be taxed.

By direction of the Treasury Department the commissioner of internal revenue is making a general survey of the revenue problem with a view to preparing a report embodying recommendations for the amendment of the revenue laws at the coming session of Congress. Among the devices for raising revenue which the Treasury officials are now considering are the following: A tax on the ownership of automobiles, ranging from $5 to $10 per car, based on horsepower, estimated to produce $25,000,000; a tax of 1 cent per gallon on gasoline, to net $12,000,000 to $15,000,000; a further increase of 50 cents per barrel in the tax on beer, figured to produce $30,000,000; a tax of 1 cent per gallon on denatured alcohol to pay cost of supervision, estimated at $200,000; the reduction of the exemption of individual incomes subject to tax from the present rates of $3,000 for single and $4,000 for married men to $1,000 for single and $1,500 for married men, together with the reduction of the incidence of the present surtax on incomes from $20,000 to $10,000, changes that would probably produce upward of $50,000,000; and the adoption of a federal inheritance tax so adjusted that it would not form too heavy a burden upon States already subject to State legacy tax laws. An upward revision of the tobacco tax law is also under consideration.

W. L. C.

The Naval Projectile Supply

WASHINGTON, D. C., Nov. 16, 1915.—Great difficulty has been experienced in obtaining projectiles in accordance with the new specifications for armor-piercing shells which were first put into practice in 1913, according to the annual report of Rear Admiral Strauss, chief of the Bureau of Ordnance of the Navy Department. Four manufacturers are now making armor-piercing shells for the department, three are making common projectiles, and a large number have competed for contracts for target projectiles. The source of supply for the last-named material has widened, two firms in the South now being engaged in its manufacture. The cost of armor-piercing projectiles of 14-in. caliber in January, 1914, was $320 each, but in March, 1915, it was $415, according to contracts let during the months mentioned. Some of the increased price may be attributed to the increased severity of specifications and part to the increased demand by reason of the European war and absence of foreign competition.

"For some months," says Admiral Strauss, "the bureau has been experimenting with the manufacture of armor-piercing projectiles at the naval gun factory, and has produced satisfactory ones of 8-in. caliber. The manufacture of experimental shells of larger caliber is being undertaken. The specifications for armor-piercing projectiles are undoubtedly severe, but they can be met. Difficulty is being experienced in having the manufacturers undertake contracts for such projectiles. In view of our own success and the fact that other manufacturers have succeeded in producing the required shells, and their evident reluctance to undertake their manufacture, the bureau believes that a projectile factory should be established by the Government, and has submitted estimates for this purpose."

"With the object of keeping pace with the increased range of modern naval warfare the bureau has increased the power of the 14-in. guns for the California, Mississippi and Idaho by increasing the length of the gun to 50 calibers and enlarging its chamber capacity. In order that these latest additions to the navy should carry the highest type of artillery the bureau took the bold step of ordering the guns without manufacturing a trial gun. The bureau's confidence in its design has been fully justified. The first gun proved not only gave the designed velocity and pressure exactly but its additional

longitudinal strength, which has been provided for, has resulted in these guns having less droop than any guns of large caliber heretofore produced. As it stands, these guns, although of less caliber and weight than the 15-in. guns now mounted abroad, are capable of penetrating the heaviest side armor at oblique impacts and at the greatest effective battle range, and give the advantage of flatter trajectory, with greater volume of fire due to the increased number that may be mounted on any ship of equal displacement. In August, 1914, a type 16-in. gun of 45 calibers length was tested. This gun fulfilled the highest expectations of its design and the bureau believes it to be as powerful a gun as is in existence to-day."

The cost of many of the materials of a strictly military character has enormously increased, owing to the demands for these materials by the belligerents, and the bureau has frequently been confronted with the necessity of paying "war prices" for such materials. This has applied with special force to high explosives for torpedoes, mines and projectiles, the prices for which have been from two to four times the normal peace-time prices. As a partial relief from this situation, Admiral Strauss says, steps have been taken to install a small plant for the manufacture of high explosives for projectiles at the naval powder factory, Indianhead, and it is expected that this plant will be in operation about Dec. 1. The manufacture of torpedoes at the Washington Navy Yard is progressing satisfactorily and the bureau hopes to manufacture there about 100 torpedoes per year. The manufacturing plant at the torpedo station will be about doubled by Jan. 1, 1916, and the output of that station should then be about 300 torpedoes per year.

W. L. C.

Successes and Failures in Scientific Management

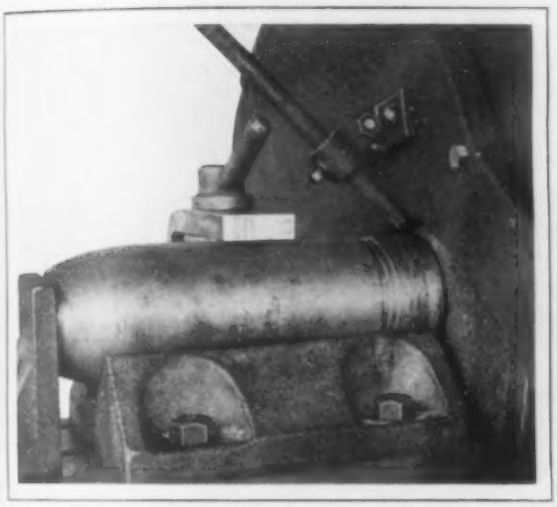
Scientific management has been completely successful in fifty-eight out of 107 plants investigated, partly successful in fifteen and failures in thirty-four. Such are the deductions made by C. Bertrand Thompson in a short article in *System*. "The total number of applications definitely known to me," as Professor Thompson puts it, "is 145." Of these 122 are classed as factories, constituting practically 1 per cent of the total number of plants of this class in the United States in 1909 which employed over 100 wage earners. The number of men in these plants is put also at 1 per cent of the number employed by the plants in 1909 employing over one hundred wage earners. Professor Thompson holds that some of the failures are due to the inexperience and incompetence of so-called experts in charge, but that more failures are due to the management, which in some cases has rushed into scientific management only to vacillate before the engineers had time to produce results. Sometimes the failure has been caused by financial troubles. In only one instance, he says, has the threat of labor difficulties been even partly responsible for failure.

Grinding the Ends of Projectile Shells

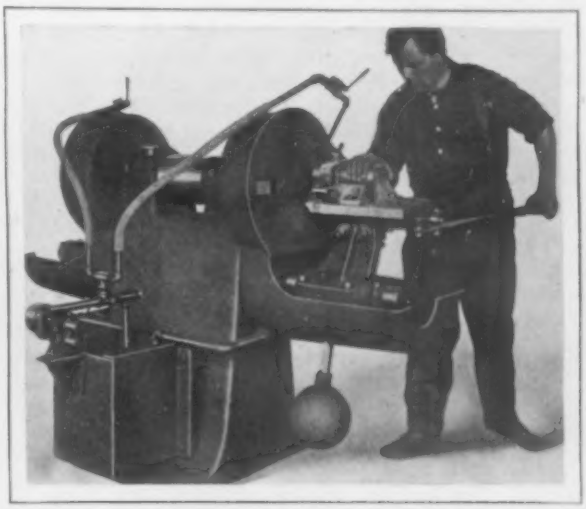
To remove the small turning hub or center projection left on the square end of a shrapnel shell, the Gardner Machine Company, Beloit, Wis., has developed a special grinding machine. This machine is also used for smoothing down the base plates of both high-explosive and shrapnel shells.

The machine consists of a heavy base casting with a spindle 2 in. in diameter mounted in ball bearings and having a ring wheel chuck mounted on each end of the spindle. These chucks contain abrasive rings, 16 in. in diameter, which are served by lever feed work tables supported on a rigid rockershaft running entirely through the base. A pump driven from the countershaft forces water or grinding compound through piping to the point of grinding contact. The hoods and basin are one-piece castings.

In operation the shell is clamped in a V-fixture and forced by a hand lever against the grinding wheel, a micrometer stop being relied upon to prevent too much stock from being removed from the shell. While the shell is in contact with the grinding wheel it is rocked across the face. The construction of this special fixture and the position of the shell while it is being ground are shown in the accompanying illustrations.



The Shell Mounted in a Special V-Fixture Having a Spring Clamping Device and an End Piece



Removing the Small Turning Hub or Center Projection from a Projectile Shell in a Double-Spindle Grinding Machine

The hourly outputs obtained vary from 40 to 100 for each end of the machine according to the size of the projection to be removed. On a 3-in. shell, the hub that has to be removed before the shell is completed is approximately ½ in. in diameter and ⅜ in. long, while that on the 3½-in. shell is the same length and the diameter is ⅜ in.

The complete equipment for this machine includes two sets of chucks and ring wheels, two lever feed work tables of the semi-universal type with the necessary shell holding fixtures, water pump and piping, a countershaft and the tools ordinarily furnished with this type of machine. The weight of the complete machine is 3500 lb.

The Noble Electric Steel Company, San Francisco, has taken an option on the Bear Canyon manganese ore mine, 20 miles from Marysville, Cal., in the expectation of using the ore in its electric smelting operations at Heroult-on-the-Pitt.

The La Salle Steel Company, Chicago, distributer of special alloy steels for motor vehicle construction, is moving from its present location at 123 South Jefferson Street to Twenty-second and Halsted streets.

Book Reviews

Effective Business Letters. By Edward Hall Gardner. Published by the Ronald Press Company, New York. Price, $2.

In this book Mr. Gardner, who is assistant professor of English in the University of Wisconsin, has made use of a wealth of material and an experience in teaching to place before the reader the fundamentals of the psychology that must be applied in the writing of a modern business letter, although he wisely designates them as the principles involved. The early chapters are illuminating in the discussion of the necessary mental attitude of the correspondent and the vital need to know familiarly the house, the goods and the customers. The keynote of the book is the opportunity of business letters to make friends for the house.

The larger portion of this volume is devoted to definite instruction in the correct writing of specific types of business letters. Numerous actual examples, selected, evidently, from some of the largest business houses of the Middle West, serve to make plain the discussion of the principles. There is such an abundance of specific instruction that one will find somewhere within the 376 pages of this book the answer or a parallel for almost every problem presented in business correspondence. The chapters on appearance, correct usage and the principles of effective writing are especially specific and should be helpful, even though the reader may differ with the author on some of his statements.

Combustion and Smokeless Furnaces. By Jos. W. Hays, combustion engineer, Chicago. Second edition, revised. Pages, 118, 6 x 9 in. Published by the author. Price, $2.

The first edition of this book was published in 1906. The author is an expert in designing and operating steam boiler furnaces, to abate the smoke nuisance without decreasing fuel economy. Engineers who are already well educated in the theory and practice of smokeless combustion and fuel saving will find nothing new in the book, but for the many thousands of boiler owners and managers of boilers who are indifferent about the smoke problem and still believe that "smoke cannot be burned" the book contains much valuable information if they would only read it. It is easy reading, the author writes in a style that any one can understand, and he uses plenty of words so that if the reader fails to comprehend one sentence he gets the meaning in the next one. For example, he takes a page and a half to tell about the mechanical equivalent of heat and Joule's and Rowland's determination of it, and another page and a half to explain what latent heat is. He uses good, strong English; for example, speaking of steam jets used for smoke consumers, he says:

> It is hard to find language sufficiently acrid to do justice to the steam jet, for its use constitutes a crime against good engineering. Something may be said in favor of almost every other class of smoke-consuming appliance, but the writer is unable to discover a single redeeming feature in the whole horizon of steam jets.

And this is followed by no less than seven pages of discussion of the total depravity of steam jets, concluding with "the feeling that a disagreeable duty has been honestly performed in the interests of good engineering."

Hendricks' Commercial Register of the United States. Pages, 1662, 7½ x 10 in. Published by the S. E. Hendricks Company, Inc., 2 West Thirteenth Street, New York City. Price, $10.

This book, which is now in its twenty-fourth annual edition, provides a comprehensive register of producers, manufacturers, dealers and large consumers connected with the architectural, contracting, electrical, engineering, hardware, iron, mechanical, mill, mining, quarrying, railroad, steel and kindred industries as well as many other channels of trade, the products listed ranging from raw materials to finished articles. The index contains almost 600 columns and approximately 1500 pages with three columns a page are required for the headings, which include a great variety of matter. The book is offered as a reference work, as well as for mailing purposes and all the distinctive features of the previous edition such as sub-classifications, trade names, etc., are included.

Shrapnel and Other War Material. A reprint of important articles presented in the *American Machinist*, January to June, 1915. Pages, 92. 8¾ x 11¾ in. Published by the McGraw-Hill Book Company, New York. Price, $1.50 net.

The material contained in this book is not only of interest to the engineer and machinist, but, in the present defenseless state of the country, it is of value to have gathered together an array of information showing how its resources can be utilized for purposes of defense. The various articles explain how machinery which was never intended for the production of war material has been adapted to the making of munitions. It shows how, when a country is under necessity of rapidly changing its mode of manufacture, it can adapt machines for purposes which hitherto were regarded as far beyond their range and capacity. It affords an example of what the American people can do when necessity requires. The book is one which may be filed away for use in the unhappy event that the United States becomes involved in war and metal working plants can immediately be converted into arsenals.

The few serious errors of the book include the omission of certain important illustrations.

Pension Plan of Stanley Rule & Level Company

The Stanley Rule & Level Company, New Britain, Conn., has announced a plan of pension for its employees to go into effect Jan. 1. Some of the older employees of the company are now on a pension system, but only as individuals. The provisions of the plan are as follows:

All men reaching the age of 70 and all women who have reached the age of 60 and having been in continuous employ of the company for 25 years or longer shall be retired and pensioned. In special cases, however, the company may extend the age limit for a limited period, if mutually agreeable.

Any man who has reached the age of 65 and any woman who has reached the age of 55 with continuous employment by the company for 25 years or more shall be retired and pensioned at his or her request.

All men reaching the age of 60 and women reaching the age of 50 with 25 years of continuous service may be retired and pensioned at request of the employee, but at the discretion of the company.

Any employee who has been 20 years or longer in continuous service and becomes permanently totally incapacitated through no fault of his or hers, as a result of sickness or injuries received while on duty, may be pensioned at the discretion of the company.

Any employee who has been in the service of the company for 30 years consecutively may, at his own request, be retired and pensioned at the discretion of the company.

The monthly pension is based as follows: One per cent of the average monthly pay during the last ten years of service multiplied by number of years of service, provided that no pension shall exceed $1,000 per year or be less than $250 per year.

Such further details as may be necessary will be given when the plan is put into operation.

The Cincinnati Railway Club held its annual meeting and banquet at the Hotel Sinton, Cincinnati, Ohio, Nov. 9. The following officers were elected: President, D. J. Durrell, master mechanic, Pennsylvania Lines; first vice-president, C. E. Rickey, division superintendent, Southern Railway; second vice-president, J. A. Morris, division superintendent, Big Four; secretary, H. Boutet, chief interchange inspector, Cincinnati Railways; treasurer, William Holmes, Galena Signal Oil Company. Definite action will be taken at the next meeting on establishing permanent headquarters.

How Long Will Prosperity Last?

The People's National Bank of Pittsburgh sends out periodically a business letter giving a general review of industrial and mercantile conditions, with the outlook for the future. In a letter dated Nov. 1, in speaking of how long the present great prosperity in the steel trade may last, the letter says:

Last spring, when munition orders were first being placed in considerable volume, the impression was strong that activity in the United States was entirely dependent upon the duration of the European war. At that time also our crops were yet to be made—some of them yet to be planted. Transportation interests were still greatly depressed. The railroads were carrying $750,000,000 of equipment for which they had had no employment for a year. The South was very slowly recovering from the depression in its special industry. In the West business was "spotty." Only the industrial sections of the East were displaying any signs of activity, and this recovery was based almost exclusively upon "rush orders" from the foreign belligerents. There was no concealment of the feeling that an overnight change in the war situation would instantly change the business outlook in this country.

To-day, however, confidence is fairly well established that business conditions in the United States will continue active at least over 1916, regardless of the duration of the war, and many operations are now being based upon that belief. This confidence rests upon this foundation: We have harvested the largest crops, taken as a whole, in the history of the country. The foreign exchange situation seems to have been bridged—temporarily at least—by the flotation of the Anglo-French loan, by the receipt of additional gold, bringing the total net imports for ten months above $300,000,000, and by the negotiation of smaller credits for Italy and probably by Russia. In addition to the foregoing factors, which have a direct bearing upon our external trade, there are others which will have an equally direct bearing upon our internal commerce. Among these may be mentioned:

First, the necessities of our railroads, which had begun to accumulate a year before the outbreak of the war and which continued to accumulate during the first half of 1915. Second, the slow but steady progress being made in extending our trade to markets heretofore supplied by the European belligerents, but necessarily neglected by them. As a local illustration we may cite the case of the American Window Glass Company of Pittsburgh, the largest concern of its kind in this country. In its annual report last month it was stated that its export trade to neutral markets enabled the company to increase its sales and net manufacturing profits over the preceding year, despite the depression which prevailed during nine months of the fiscal period. Third, the probability that as a direct outcome of the war the United States will embark upon a program of military and naval expansion. The Washington administration has already approved tentative plans for such expansion which will be urged upon Congress soon after it assembles next month. This movement will encounter strong opposition, but it will doubtless be supported in Congress in modified form.

The Wisconsin-Minnesota Light & Power Company, Eau Claire, Wis., has awarded the general contract for the construction of its new dam and power house on the Chippewa River, near Chippewa Falls, Wis., to the Kelsey-Brewer Construction Company, Grand Rapids, Mich., subject to approval by the Railroad Commission. The output will be 43,000 hp., making it the largest hydroelectric plant in Wisconsin.

Swedish exports of pig iron for the first seven months of this year were 143,200 metric tons against 89,000 tons in the same period a year ago. Total exports of iron and steel to Aug. 1, 1915, were 292,500 tons as compared with 233,000 tons to Aug. 1, 1914, an increase of 59,500 tons.

NATIONAL FOUNDERS' MEETING

Reports of Officers at Annual Gathering in New York This Week

The address of President William H. Barr, the main points of which may be found on page 1174 of this issue, was presented at the opening of the session at the Hotel Astor, on Wednesday, Nov. 17, and was well received. Following the reading of Secretary J. M. Taylor's report, "General Conditions" were discussed by George F. Monaghan, general counsel of the association, and "Safety in the Foundry," by Magnus W. Alexander, General Electric Company, West Lynn, Mass.

Wednesday afternoon is to be taken up with addresses by the presidents of the National Metal Trades Association, the National Association of Manufacturers, the National Association of Woolen Manufacturers and the National Association of Cotton Manufacturers. The usual banquet will be held Wednesday night and the convention closes on Thursday morning with talks on foreign trade, the "New Era in Industrial Relations in the State of New York," and "Shall Congress Regulate Production?"

The alumni dinner on Tuesday night, of former officers and members of the administrative council, was the largest on record.

Employers' Association at Springfield, Mass.

The Employers' Association of Hampden County was organized at Springfield, Mass., Oct. 18. Its plans have not been sufficiently formulated for announcement but it is understood that its main objects will be constructive rather than purely defensive. The officers chosen are Harry G. Fisk, Fisk Rubber Company, president; F. C. Breakspear, A. G. Spalding & Bros. Mfg. Company, first vice-presidents; C. I. Gagnier, Gagnier & Angers, second vice-president; F. F. Squire, secretary; E. B. Atmus, Bosch Magneto Company, treasurer. The board of managers is composed of A. W. Gilbert, Chapman Valve Mfg. Company; R. D. Reed, H. B. Smith Company; C. L. Newcomb, Deane Steam Pump Company; E. L. C. Clark, New England Westinghouse Company; G. W. Kyberg, Package Machinery Company; J. L. Brooks, Brooks Bank Note Company; G. M. Hendee, Hendee Mfg. Company; C. B. Potter, Potter Knitting Company; A. J. Tucker, Cheney-Bigelow Wire Company; H. A. Ley, Fred T. Ley & Co.

The Iroquois Iron Company, Chicago, has recently had shipped to its furnaces at South Chicago a few thousand tons of northern Iowa non-Bessemer ore. Inasmuch as the rail freight rate from the northern Iowa mines compares with water rates from the Lake Superior district ports with no great disadvantage, the experiment being undertaken with this small shipment suggests an interesting possibility. Should these ores be found satisfactory, their availability will doubtless have a bearing on the blast-furnace situation at St. Louis also.

The Bethlehem Steel Company and the E. W. Bliss Company have been allowed the benefit of drawback on duty paid on imported lead, antimony and antimonial lead used in the manufacture of articles for export, principally shrapnel.

The Van Dorn & Dutton Company, gears and gear cutting, Cleveland, Ohio, has moved its New York office from 50 Church Street to 556 West Thirty-fourth Street and has appointed Frank Van Anden district sales manager in charge of that office.

The sale of the foundry department of the Erie Engine Works, Erie, Pa., to the American Malleable Company, New York City, is announced. This foundry has not been in operation for the past two years.

ESTABLISHED 1855

THE IRON AGE

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Export Growth Checked

Our need of ships is being more than emphasized by the condition of railroad traffic at Eastern seaport terminals. This is most strongly marked in the vicinity of New York. It is estimated by railroad authorities that about 25,000 carloads of all kinds of merchandise intended for export are held up either in the vicinity of New York or on the way to that city, because ships are not available to handle the enormous business of this character which is now moving. This is causing much inconvenience not only to exporters but also to shippers further in the interior. The cars thus loaded with merchandise for export cannot be released and sent back for other use, and hence railroad traffic is getting to be badly hampered. It is stated that it has been found necessary to unload cars destined for New York at points at some distance from the city because of complete inability to get them through to New York for unloading. It is regarded as probable that an embargo may shortly be laid on export business until the congestion of loaded cars has been relieved.

The situation which is above described applies as well to railroad companies having excellent terminal facilities as to those which have not improved their facilities to any extent in recent years. It is therefore a matter which is not to be blamed on the railroads, but is to be attributed to the lack of steamships to take away the heavy accumulations of export merchandise. The flow of traffic is free and unrestricted so far as the railroads are concerned, but is summarily checked at the shipping docks. This constriction could have largely been prevented if this country had begun to prepare to provide more ships when the European war broke out and the world's shipping service was demoralized. All sorts of measures for stimulating American shipping have been brought forward, but such a difference of opinion has existed that nothing has been done except to remove some of the restrictions on placing foreign ships under our flag.

We are now most seriously feeling the result of years of neglect of our shipping interests. The situation existing at the Atlantic seaports will probably continue to grow worse unless the European war should suddenly cease, thus causing a heavy decline in the demand for goods from this country. If it continues to grow worse it is possible that such a cry will go up for relief that Congress at its approaching session may be driven to formulate some remedy. There have been emergencies when frantic business interests have so sharply prodded our lawmakers that they have been able to get together and do something. If they cannot get together now, when our export trade is being held back from its proper development and when our transpacific commerce is completely passing into the hands of foreign countries, the American shipping situation may be regarded as hopeless.

An Unbalanced Steel Market

The tendency of continued buying movements in steel is to develop a particularly heavy demand in one or two products. In the 1912 movement a special feature was the erection of large office buildings requiring structural shapes in large sizes, and in no other product were deliveries so far protracted. There have also been occasions when the strongest demand was for rails and track supplies, and bar mills have more than once been under special strain. It has never happened in the history of the industry that semi-finished steel was so sought as now or commanded prices so far out of proportion to those paid for finished forms.

An interesting feature of the present situation is the limited call for heavy structural shapes. In finished material bars have been obviously the line of greatest activity, followed closely in the East by ship plates. But in structural shapes the buying has been restricted consistently to angles and small channels and beams, with a comparatively small demand for the latter. While there has been, in the past few months, no small amount of building, it has been largely plant extensions, calling for mill-building construction and requiring no heavy shapes, or it has been a matter of car steel that has run almost entirely to lighter shapes.

With steel works sold up, particularly as far as semi-finished steel is concerned, and also in most finished lines, to a degree never before exceeded, structural mills are in actual need of business calling for the larger sizes. While 1.60 cents, Pittsburgh, and even 1.70 cents is quoted by some mills that have taken large structural orders in the smaller sizes, 1.40 cents has been quoted by an Eastern structural mill which within the past fortnight has also taken direct a large building contract to make sure of the regular plain material basis.

It has been a lopsided market at every stage in the advance, certain spots, notably parts of the

structural field, and not so long ago some sheet lines, giving evidence of competition no less keen than usual, while elsewhere the characteristics of an old-time boom were unmistakable. Being a market largely created by war conditions, it has been subject to no ordinary rules and has developed in its own unbalanced and unprecedented way.

Germany's Gain in Steel

In our issue of April 22, 1915, we commented on Germany's gain in steel production and what it might mean to us at the conclusion of the war. Then the rate of production compared with the rate before the war started, taken as a standard, was 55 per cent of the normal in pig iron and 59 per cent in steel, contrasting with 35 per cent of the normal in the first two months of the war.

On another page of this issue we present figures of Germany's steel and pig-iron output for the first year of the war. Taking July, 1914, as a fair normal rate before the war, the extent of the recovery after one year of war is practically 70 per cent in both pig iron and steel in daily output. This is a really remarkable showing, considering the exceedingly great drain on men, the strain on the country and the heavy diminution in export trade.

The role which Germany will play as an exporter of iron and steel when the war ends is one which demands our serious consideration. Her iron and steel plants will probably be unharmed—injured only by loss of men. France and Belgium will probably be largely occupied in filling their own needs. Aside from the great loss in their industrial armies, Great Britain and Russia will have much at home to occupy their steel and iron plants. While the unwillingness of countries now at war with Germany to take her products later will be a large factor, in time, price and delivery will be likely to rule. If the danger to our eastern and western seaboards was considerable as regards the assimilation of Germany's post-bellum steel surplus when we called attention to this possibility before, how much more is this emphasized and intensified now in the light of more recent developments? Surely anti-dumping legislation should be seriously considered in these low-tariff times.

While the recent activity of British submarines in the Baltic Sea is probably seriously hampering Germany's receipts of Swedish hematite ore, so necessary to her ammunition industry, the extent of the stocks already accumulated in the last year is also a factor as to the future of Germany's output of steel. In any event, the role that that country's steel industry may play in world competition after the war is not to be lightly considered.

The Season Price on Tin Plate

The announcement late last week of the season price on tin plate, at $3.60 for 100-pound cokes, directs attention to the fact that there remains a branch of the finished-steel trade that has not cut loose from the practice of making practically one-year contracts for the sale of its product. It is not an unimportant branch, as in recent years it has been making 900,000 to 1,000,000 gross tons, or about 5 per cent of the total output of finished steel. Gradually in recent years the steel manufacturers have broken away from the custom of selling product far ahead, and quarterly contracts may now be said to be the rule. Contracts for six months, while by no means unknown, are to be regarded as exceptional. The buyer is given something when the term of contract is made long, and it is difficult to see that the seller receives a corresponding offset. The two parties do not take chances respectively on market fluctuations, for the contract is guaranteed to the buyer against decline and the seller is given no offset in case of an advance.

Trade custom, rather than trade conditions, seems to be responsible for the practice of making annual contracts for tin plate. The buyer of tin plate, of course, and particularly the can maker, points out that he must sell his own product a season ahead, and therefore must be protected as to his raw material, but the position of the can maker in this respect cannot easily be defended. It is quite obvious that his customers, the canners, cannot make the same plea that they must sell their own product a season ahead. Within a very few years each canner would, in his turn, be ruined, for the canner does not know how much he is going to be able to pack, that depending largely upon the various crops, which are regulated by the weather, and if a full output were sold there would soon come a season in which it could not be delivered. No doubt the canner would demand a season contract from the soil and weather if they were as accommodating as are the can makers and tin-plate manufacturers.

The tin-plate makers are always confronted with uncertainties as to prices and supplies of their raw material, but the remarkable nature of this tin-plate trade custom of making season contracts is emphasized by the exceptional hazards of the coming twelvemonth. To an extent steel can be contracted for, but all the tin-plate mills cannot contract for a full year's supply of steel, and none of them can be certain of adequate deliveries.

In the case of pig tin it appears practically impossible to cover. Hitherto there has been the opportunity to buy large quantities for delivery over several months, a portion of the tin being later sold for prompt shipment, a corresponding quantity being then bought for the later delivery then obtainable. The objection to this system is that the tin plate is sold guaranteed against decline, while the pig-tin purchase is irrevocable. In any event, it does not seem possible to follow such a practice now, since the English regulations require the tin buyer to obligate himself not to resell the tin. There are grave dangers that tin may advance sharply in price, and certainly there are doubts whether regular deliveries will be obtainable throughout the twelvemonth. With palm oil and sulphuric acid there are equal or greater dangers. The advance in tin plate to $3.60 for the coming season, as compared with the $3.20 price announced a year ago, takes cognizance of the advances meanwhile in sheet bars and pig tin, but does not cover advances in oil and acid that are already an accomplished fact, while no allowance is made for advances in any of the raw materials that may occur in future.

In a market in which there is relatively little price competition the practice of selling the product so far ahead, with uncertain raw material pros-

pects, might not be so reprehensible, but tin plate is not in that category. For several years there has been very severe price competition, and the competition frequently has not ended when the contracts were signed, sellers often endeavoring to obtain orders from consumers who have already contracted to draw their supplies from another source. Either the manufacture of tin plate has been fairly profitable in recent years, despite the apparent drawbacks, or there is a definite trend toward destructive competition.

Tie Plates in Scrap Lists

Recent railroad scrap lists show what are probably the first lots of tie plates in quantity to return to the market as old material. The life of a steel tie plate in service apparently is not long. A decade measures the period in which the use of these plates has grown from the experimental stage, with its mile or two of track laid in this manner, to the situation to-day when one road buys 15,000,000 in a single purchase. The rapidity with which the tie plate has come into favor is one of the interesting developments in maintenance of way engineering. Its depreciation in service adds an interesting item to the scrap list. Comparisons are likely to be made between the life of iron plates and of steel plates, in view of the severe exposure to corrosion, due to moisture and to briny drippings from passing cars. There is still something to be learned to the end that both design and quality of steel may contribute to a longer period of service.

Some New Production Records

In October the Cambria Steel Company, Johnstown, Pa., turned out 122,069 net tons of finished steel. The best previous record for one month was 107,708 tons. The blast furnaces of this company averaged 486 tons each per day for the whole month of October.

In one turn of 8 hr. recently, the 40-in. blooming mill in the Bessemer steel plant of the Republic Iron & Steel Company, Youngstown, Ohio, rolled 905 tons. The output in the Bessemer and open-hearth plants of the company has been running very heavy of late, and new records are constantly being made in the finishing mills.

In the week ended Nov. 6, the sheet-mill department of the Youngstown Iron & Steel Company, Youngstown, Ohio, turned out 1523 tons of finished sheets, exceeding any previous output for one week by 80 tons. Still larger figures of output are expected to be reached by this department.

Large Inquiries for Locomotives

Inquiries for 207 locomotives are reported before the market in the past week. The Pennsylvania Railroad, in addition to the 75 recently ordered, is inquiring for 155, of which 95 are freight and 60 switching locomotives, while the New York, New Haven & Hartford is asking for bids on 30. Besides these the Erie wants 10 new locomotives, the Chicago & Eastern Illinois 5, the Toledo, St. Louis & Western 5, and the Birmingham Southern 2. The Pennsylvania Lines West is reported to have ordered 53 locomotives from the Lima Locomotive Corporation and 10 from the American Locomotive Company. Orders for 7 others are distributed among smaller roads.

Preparations are being made to blow in the furnace of the Juniata Furnace & Foundry Company, Newport, Pa., which has been idle for several years. Alfred Marshall is president of the company, and Edward E. Marshall, president American Manganese Mfg. Company, is vice-president and general manager, with offices in Philadelphia.

J. Leonard Replogle and Others Buy Large Cambria Steel Company Holdings

Another chapter was added in the past week to the seemingly interminable story of Cambria Steel Company and Pennsylvania Steel Company stock ownership. J. Leonard Replogle, who resigned last year as vice-president and general sales manager of the Cambria Steel Company, after 25 years in its employ, to become vice-president of the American Vanadium Company, concluded on Thursday, Nov. 11, the purchase of 224,000 to 240,000 shares (the amount is variously stated) of Cambria Steel Company stock held by the Pennsylvania Railroad. The price paid is reported at $14,000,000 to $15,000,000. Mr. Replogle represented in this purchase a syndicate whose membership is not entirely known, but his associates include E. V. Babcock, Charles J. Graham and Frank J. Lanahan, of Pittsburgh. Mr. Babcock is interested in lumber and coal and coke properties and is a director in two Pittsburgh banks. Charles J. Graham is vice-president of the Graham Nut Company and was recently elected president of the American Hardware Manufacturers' Association. Mr. Lanahan is president of the Fort Pitt Malleable Iron Company, McKees Rocks, Pa., and is a director in a number of industrial companies. In addition to the stock purchased from the Pennsylvania Railroad, Mr. Replogle and his associates have various holdings in the Cambria Steel Company, the amount of which is not stated.

According to the first publication of the purchase it was made after a contest between Replogle and Donner interests, but later statements, which leave something to be read between the lines, intimate that there is harmony between the present Cambria management and the buyers of this large portion of the Pennsylvania Railroad holdings. The Pennsylvania Railroad's representatives on the Cambria board, Effingham B. Morris and Theodore N. Ely, are expected to resign and Mr. Replogle and one of his associates are likely to take their places. The following statement was given out from the office of President Donner of the Cambria Steel Company at Philadelphia on Friday:

> Mr. Donner confirmed the report that the Pennsylvania Company had disposed of the balance of its Cambria Steel Company stock. He understands that the syndicate of purchasers is composed of very substantial business people who have taken over the stock largely as an investment and will undoubtedly be interested in seeing Cambria's valuable properties further developed. Mr. Donner stated that the improvements made last year were proving quite profitable and that not only was present business very satisfactory but the future outlook most promising. Mr. Donner said there had been no fight for control and that in so far as he knew no such controversy would occur.

From Pittsburgh the report comes that the Replogle interests and those whom they represent now have control of the Cambria Steel Company. This is not inconsistent with the Philadelphia statement that there has been no fight for control. Other Pittsburgh names than those given above are mentioned in connection with the purchase made by Mr. Replogle, including the heads of a large banking house.

Reports in Philadelphia financial circles that W. H. Donner and others are considering the formation of a company to be known as the Keystone Steel Company, for the purpose of taking over the Pennsylvania Steel Company, have been confirmed in part. It was explained that this is an arrangement for financing the plans for putting the Pennsylvania Steel Company on its feet. The plan contemplates also taking over the remainder of the Pennsylvania Railroad and Reading Railroad holdings in the Pennsylvania Steel Company. It is believed that the developments of the past week mean that the Cambria Steel Company and the Pennsylvania Steel Company will not be consolidated.

A tin-plate factory is reported to be contemplated at or near Seattle, Wash., by U. K. Loose, former president of the Assets Financing Company, Seattle, and W. G. Owen, an English tin-plate expert. It is stated that plans for financing such an industry, estimated to cost $2,000,000, have been completed.

MUNITIONS COMPANIES MERGE

Holding Company for Screw Machine and Valve Plants—Two New Corporations

Through an official of the American Steam Gauge & Valve Company, Boston, confirmation is had of the purchase by R. B. Phillips and associated interests of the plants of the National-Acme Mfg. Company, Cleveland, Ohio, and the Windsor Machine Company, Windsor, Vt., makers of automatic screw machines. Steps are now being taken for the incorporation in Delaware of a company to be known as the Phillips Corporation, which will be a holding company for the following companies: American Steam Gauge & Valve Company, Boston; R. B. Phillips Mfg. Company, Worcester and Lowell, Mass.; Windsor Machine Company, Windsor, Vt.; National-Acme Mfg. Company, Cleveland, Ohio, and New England Steel & Ordnance Company. The last-named company is to be incorporated in Delaware and is to operate a plant at Portsmouth, N. H., for the manufacture of ordnance and shells. It also was said by the official referred to that the New England Steel & Ordnance Company was contemplating shipbuilding. From another source it is reported that the Portsmouth plant will turn out 400,000 shells ordered by the French Commission.

In reply to a question as to whether the National-Acme and Windsor machine companies would continue to market their machines, Mr. Phillips's representative said they certainly would take care of the public, and the reason for the taking over of the two tool plants was that it would enable them to develop sizes of machines as wanted. The initial stock issue of the Phillips Corporation will consist of $25,000,000 cumulative, preferred and common shares. The several plants have war orders aggregating about $60,000,000. Mr. Phillips is to be president of the new company and Lloyd H. Atkinson, formerly of the Bethlehem Steel Corporation, vice-president. Offices will be established in New York.

The plant which will be occupied by the New England Steel & Ordnance Company was built for the White Mountain Paper Company, but never was successfully operated as a paper plant.

The World's Largest Plate Mill

To meet the increasing demand for very wide plates, the Lukens Iron & Steel Company, Coatesville, Pa., is arranging for the construction of what will be the largest plate mill in the world. President A. F. Huston states that the length of the rolls of this mill will be from 200 to 204 in., and that it will be capable of rolling finished plates about 16 ft. in width. It is understood that the largest mill in the world at present, located at Witkowitz, Hungary, has rolls 178 in. long.

This will make the third time in its history that the Lukens Company has had the largest plate mill in the world. In 1890 it built a mill with rolls 120 in. long, enlarged later to 132 in., which was the largest at that time. In 1902 the company built its present 140-in. mill, which placed it in the lead again, holding this position until the Worth Brothers Company and later the Otis Steel Company built mills with rolls 152 in. long.

The contract for the mill has been placed with the United Engineering & Foundry Company, Pittsburgh. It will be a four-high mill, of the type used for rolling armor plate in the plant of the Carnegie Steel Company, and will be the first of this kind to be designed for general plate rolling. The two working rolls will be of chilled iron, 34 in. in diameter, and the other two of steel, 50 in. in diameter. From the top of the top roll to the bottom of the bottom roll, when all the rolls are set close, will be 168 in., thus presenting a gigantic structure for a plate mill. No contract has yet been placed for the engine, the design of which is now under consideration. It will probably be 55 x 60 in., compound reversing, if it shall be found that this will not overpower the mill.

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The company is making a number of improvements in the plant, increasing the electric power, etc., to provide for the proper working of the new mill. It is also preparing to place in operation its slab mill, which has been idle for several years. To do this, new gas producers will have to be built and new cranes installed. The operation of the slab-mill will, of course, increase the output of the plate mills.

Carnegie Additions at Youngstown

The Carnegie Steel Company, Pittsburgh, has started the erection of three more 60-ton furnaces at the open-hearth plant of its Ohio works, Youngstown, Ohio. These furnaces will make a total of fifteen 60-ton furnaces at this plant and will increase the daily capacity about 400 tons. Work will be pushed as fast as possible, and it is expected to have the new furnaces ready about Feb. 1. The extension to the present open-hearth building at Youngstown will be built by the American Bridge Company, and will take about 600 tons of steel.

Plans are under way for additions to some of the Carnegie works in the Pittsburgh district, but nothing official as to what these additions will be has been given out.

The Iron and Metal Markets

NO CHECK ON PRICES

Advances in Pig Iron and Finished Lines

Steel Works Additions in Every Direction—Iron Ore Advance to Exceed 50 Cents

With new orders steadily running far in excess of current output, it was not surprising that the United States Steel Corporation withdrew quotations in foreign markets last week. This action does not in itself mean a long withdrawal from the export trade, for similar steps are taken at intervals in the domestic market. The fact is that the steel companies have the greater part of their output sold for four or five months, some for most of the first half of 1916, and that in certain lines the market on forward deliveries has been sold to a standstill.

Conservative men in the trade who thought two months ago to hold demand in check by asking sharp advances have given up effort on that line. The past week has shown unmistakable signs of a steel market that has cut loose. Pig iron, with somewhat less reason, is following the course of steel.

The price advances of the week include 50c. in most pig-iron centers, $3 on forging billets and $2 on wire rods; in finished materials, $2 to $4 on plates and sheets, $1 on wire and wire nails, $3 on forging billets, $2 to $3 on tin plate for early shipment, $2 on iron and hard steel bars, $5 on cold-rolled strip steel. The refusals of offered business and the straining of mills to increase output only make it surer that buyers will push prices higher.

The fever has spread to the Lake Superior ore trade and buying for next year may not wait for the closing of navigation. Prospects are now that 50c. will not be the limit of the ore advance. The boom of 1906 put up Bessemer ores 75c. As much as $1 is now talked of. Charters for next season's ore at 50c. from the head of the lakes, against 40c. this year, have already taken up most of the available tonnage. If pig-iron production should go on for a year at the present rate nearly 60,000,000 tons of Lake ore would be needed in 1916.

In a situation without any precedent, the usual dangers of high prices are being ignored. It should not be forgotten that buying in building and various other lines is not forced by war necessity.

Building of new steel capacity is being pushed in every direction and each week brings announcements of new undertakings by the Steel Corporation and independent companies—not so unlike the policy of the railroads, of which the steel trade sometimes complains, in making extensions under the pressure of record demand. The steel industry is compelled to add to its own embarrassments by the steel it is requiring for new work.

The structural steel trade has shown no such scramble for material as is seen in bars and plates, and the mills could take more business in large beams. In October, fabricating contracts represented 78 per cent of the capacity of the bridge and structural shops. Western fabricators have had better success in covering for their requirements in the first half of next year than shops in the East.

Among large work to be bid on in the next few weeks are two subway sections in Manhattan and Brooklyn. Together they represent 43,000 tons of tunnel segments and 30,000 tons of structural steel.

Tin-plate manufacturers have opened their books for 1916 contracts at $3.60 a box, or 40c. advance upon the 1915 basis. While sales for this year were made below $3, under present conditions the concession to largest buyers is likely to be very small.

As against a formal advance of $1 in wire and wire nails, announced Nov. 12, bringing nails to $1.90 and plain wire to $1.75, from $3 to $4 a ton above regular prices is paid for quick delivery of plain and barb wire. For export barb wire offers of $10 a ton above the contract basis have been made.

For each of the two battleships on which bids were opened this week 11,500 tons of hull plates, 4500 tons of deck plates and 6000 tons of armor plate will be required. Plate mills are able to get large premiums for early shipment, as high as 2c., Pittsburgh, having been paid, and more frequently 1.80c. and 1.85c.

At Chicago the week's rail buying has amounted to 60,000 tons, including the Rock Island's 40,000 tons. The Northern Pacific has distributed 20,000 tons to the Illinois, Lackawanna and Bethlehem mills.

Pig-iron prices and production keep up their advance week after week. Buying has not been particularly heavy, but evidence that foundries are increasing their melt accumulates in the form of purchases for delivery this year. Chicago, Buffalo, Cleveland and Valley furnaces were conspicuous in a 50c. advance this week. Here and there a furnace is dropping out for the inevitable repairs, but these offset only in part the furnaces that are blowing in.

A Comparison of Prices

Advances Over the Previous Week in Heavy Type. Declines in Italics

At date, one week, one month and one year previous

	Nov. 17, 1915.	Nov. 10, 1915.	Oct. 20, 1915.	Nov. 18, 1914.
Pig Iron, Per Gross Ton:				
No. 2 X, Philadelphia	**$17.25**	$16.75	$16.25	$14.50
No. 2, Valley furnace	**15.75**	15.25	15.00	12.75
No. 2 Southern, Cin'ti	**16.40**	15.90	14.90	12.90
No. 2, Birmingham, Ala.	**13.50**	13.00	12.00	10.00
No. 2, furnace, Chicago*	**17.50**	17.00	14.75	12.50
Basic, del'd, eastern Pa.	**17.50**	17.00	17.00	14.00
Basic, Valley furnace	**16.00**	15.50	15.00	12.50
Bessemer, Pittsburgh	**17.70**	17.45	16.95	14.55
Malleable Bess., Ch'go*	**17.50**	17.00	15.50	12.75
Gray forge, Pittsburgh	**15.95**	15.45	14.70	13.40
L. S. charcoal, Chicago	**17.25**	16.75	15.75	15.75
Billets, etc., Per Gross Ton:				
Bess. billets, Pittsburgh	**27.00**	26.00	24.50	19.00
O.-h. billets, Pittsburgh	27.00	27.00	25.00	19.00
O.-h. sheet bars, P'gh	28.00	28.00	25.50	20.00
Forging billets, base, P'gh.	**48.00**	45.00	34.50	24.00
O.-h. billets, Phila	**34.00**	32.00	32.00	21.40
Wire rods, Pittsburgh	**37.00**	35.00	32.00	25.00

*The average switching charge for delivery to foundries in the Chicago district is 50c. per ton.

Sheets, Nails and Wire, Per Lb. to Large Buyers:	Nov. 17, 1915. Cents.	Nov. 10, 1915. Cents.	Oct. 29, 1915. Cents.	Nov. 18, 1914. Cents.
Sheets, black, No. 28, P'gh	**2.25**	2.20	2.00	1.85
Galv. sheets, No. 28, P'gh	**4.00**	3.70	3.50	2.85
Wire nails, Pittsburgh	**1.90**	1.85	1.85	1.60
Cut nails, Pittsburgh	1.80	1.80	1.70	1.60
Fence wire, base, P'gh	**1.75**	1.70	1.70	1.40
Barb wire, galv., P'gh	**2.75**	2.70	2.70	2.00
Finished Iron and Steel, Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Bess. rails, heavy, at mill	1.25	1.25	1.25	1.25
Iron bars, Philadelphia	**1.759**	1.709	1.559	1.12
Iron bars, Pittsburgh	**1.60**	1.50	1.40	1.15
Iron bars, Chicago	**1.50**	1.45	1.35	0.95
Steel bars, Pittsburgh	**1.70**	1.60	1.45	1.10
Steel bars, New York	**1.869**	1.769	1.619	1.26
Tank plates, Pittsburgh	**1.70**	1.60	1.45	1.05
Tank plates, New York	**1.869**	1.769	1.619	1.26
Beams, etc., Pittsburgh	1.60	1.60	1.45	1.10
Beams, etc., New York	**1.769**	1.669	1.619	1.26
Skelp, grooved steel, P'gh	1.60	1.60	1.40	1.10
Skelp, sheared steel, P'gh	1.70	1.70	1.45	1.15
Steel hoops, Pittsburgh	1.75	1.75	1.50	**1.25**
Old Material. Per Gross Ton:				
Iron rails, Chicago	**15.00**	14.50	13.50	11.00
Iron rails, Philadelphia	17.50	17.50	17.50	13.00
Carwheels, Chicago	**13.25**	13.00	12.00	9.50
Carwheels, Philadelphia	14.00	14.00	13.50	9.50
Heavy steel scrap, P'gh	**16.00**	15.50	14.50	10.00
Heavy steel scrap, Phila.	14.50	14.50	14.50	9.25
Heavy steel scrap, Ch'go.	**13.50**	12.75	11.75	7.75
No. 1 cast, Pittsburgh	**14.00**	13.50	12.75	10.50
No. 1 cast, Philadelphia	**14.50**	14.00	14.00	11.00
No. 1 cast, Ch'go (net ton)	**12.00**	11.75	10.50	8.50
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.25	$2.50	$2.00	$1.50
Furnace coke, future	2.50	2.50	2.25	1.75
Foundry coke, prompt	3.00	3.00	2.25	1.90
Foundry coke, future	**3.00**	2.75	2.60	2.15
Metals. Per Lb. to Large Buyers:	Cents.	Cents.	Cents.	Cents.
Lake copper, New York	**19.00**	18.25	17.75	12.00
Electrolytic copper, N. Y.	**18.87½**	18.12½	17.75	11.87½
Spelter, St. Louis	**17.12½**	15.75	13.25	4.95
Spelter, New York	**17.37½**	16.00	13.50	5.10
Lead, St. Louis	**5.15**	5.05	4.42½	3.62½
Lead, New York	**5.25**	5.15	4.50	3.70
Tin, New York	**42.75**	36.50	33.25	32.50
Antimony, Asiatic, N. Y.	**37.50**	36.00	29.00	13.50
Tin plate, 100-lb. box, P'gh.	**$3.30**	$3.25	$3.15	$3.15

Finished Iron and Steel f. o. b. Pittsburgh

Freight rates from Pittsburgh in carloads, per 100 lb.: New York, 16.9c.; Philadelphia, 15.9c.; Boston, 18.9c.; Buffalo, 11.6c.; Cleveland, 10.5c.; Cincinnati, 15.8c.; Indianapolis, 17.9c.; Chicago, 18.9c.; St. Louis, 23.6c.; Kansas City, 43.6c.; Omaha, 43.6c.; St. Paul, 32.9c.; Denver, 68.6c.; New Orleans, 30c.; Birmingham, Ala., 45c.; Pacific coast, 73.9c. on plates, structural shapes and sheets and 65c. on wrought pipe and boiler tubes. The foregoing rates to the Pacific coast are by rail. The rate via New York and the Panama Canal is 56.9c.

Plates.—Tank plates, ¼ in. thick, 6¼ in. up to 100 in wide, 1.60c. to 1.70c., base, net cash, 30 days. Following are stipulations prescribed by manufacturers:

Rectangular plates, tank steel or conforming to manufacturers' standard specifications for structural steel dated Feb. 6, 1903, or equivalent, ¼ in. and over on thinnest edge, 100 in. wide and under, down to but not including 6 in. wide, are base.

Plates up to 72 in. wide, inclusive, ordered 10.2 lb. per sq. ft., are considered ¼-in. plates. Plates over 72 in. wide must be ordered ¼ in. thick on edge or not less than 11 lb. per sq. ft., to take base price. Plates over 72 in. wide ordered less than 11 lb. per sq. ft. down to the weight of 3-16 in. take the price of 3-16 in.

Allowable overweight, whether plates are ordered to gage or weight to be governed by the standard specifications of the Association of American Steel Manufacturers.

Extras	Cents per lb.
Gages under ¼ in. to and including 3-16 in.	.10
Gages under 3-16 in. to and including No. 8	.15
Gages under No. 8 to and including No. 9	.25
Gages under No. 9 to and including No. 10	.30
Gages under No. 10 to and including No. 12	.40
Sketches (including straight taper plates), 3 ft. and over	.10
Complete circles, 3 ft. in diameter and over	.20
Boiler and flange steel	.10
"A. B. M. A." and ordinary firebox steel	.20
Still bottom steel	.30
Marine steel	.40
Locomotive firebox steel	.50
Widths over 100 in. up to 110 in., inclusive	.05
Widths over 110 in. up to 115 in., inclusive	.10
Widths over 115 in. up to 120 in., inclusive	.15
Widths over 120 in. up to 125 in., inclusive	.25
Widths over 125 in. up to 130 in., inclusive	.50
Widths over 130 in.	1.00
Cutting to lengths under 3 ft. to 2 ft., inclusive	.25
Cutting to lengths under 2 ft. to 1 ft., inclusive	.50
Cutting to lengths under 1 ft.	1.55

No charge for cutting rectangular plates to lengths 3 ft. and over.

Wire Products.—Prices to jobbers: Fence wire, Nos. 0 to 9, per 100 lb., terms sixty days or 2 per cent discount in ten days, carload lots, annealed, $1.75; galvanized, $2.45. Galvanized barb wire and staples, $2.75; painted, $2.05. Wire nails, $1.90. Galvanized nails, 1 in. and longer, $1.75 advance over base price; shorter than 1 in., $2.25 advance over base price. Woven wire fencing, 68½ per cent off list for carloads, 67½ off for 1000-rod lots, 66½ off for less than 1000-rod lots.

The following table gives the price per 100 lb. to retail merchants on fence wire in less than carloads, with the extras added to the base price:

Plain Wire, per 100 lb.

Nos.	0 to 9	10	11	12&12½	13	14	15	16
Annealed	$1.80	$1.85	$1.90	$2.00	$2.10	$2.20	$2.30	$2.40
Galvanized	2.70	2.75	2.80	2.85	2.90	3.05	3.40	3.50

Wire Rods.—Bessemer, open-hearth and chain rods, $37 to $38.

Structural Material.—I-beams, 3 to 15 in.; channels, 3 to 15 in.; angles, 3 to 6 in. on one or both legs, ¼ in. thick and over, and zees 3 in. and over, 1.60c.

Wrought Pipe.—The following are the jobbers' carload discounts on the Pittsburgh basing card in effect from Aug. 16, 1915, on steel and iron galvanized pipe, and from Nov. 1, 1915, on steel and iron black pipe, all full weight:

Butt Weld

Steel			Iron		
Inches	Black	Galv.	Inches	Black	Galv.
⅛, ¼ and ⅜	71	46½	⅛ and ¼	63	37
½	75	59½	⅜	63	37
¾ to 3	78	63½	½	67	47
			¾ to 2½	70	52

Lap Weld

2	75	60½	1¼	54	36
2½ to 6	77	62½	1½	65	47
7 to 12	75	58½	2	66	49
13 and 14	61½	..	2½ to 4	68	52
15	59	..	4½ to 6	68	52
			7 to 12	66	50

Reamed and Drifted

1 to 3, butt	76	61½	1 to 1½, butt	68	50
2, lap	73	58½	2, butt	68	50
2½ to 6, lap	75	60½	1¼, lap	52	34
			1½, lap	63	45
			2, lap	64	47
			2½ to 4, lap	66	50

Butt Weld, extra strong, plain ends

⅛, ¼ and ⅜	66	49½	⅜	60	43
½	71	58½	½	65	51
¾ to 1½	75	62½	¾ to 1½	69	53
2 to 3	76	63½	2 and 2½	70	54

Lap Weld, extra strong, plain ends

2	72	57½	1½	64	48
2½ to 4	74	59½	2	66	49
4½ to 6	73	58½	2½ to 4	68	52
7 to 8	67	50½	4½ to 6	67	51
9 to 12	62	45½	7 to 8	60	44
			9 to 12	55	39

Butt Weld, double extra strong, plain ends

½	61	48½	½	55	40
¾ to 1½	64	51½	¾ to 1½	58	43
2 to 2½	66	53½	2 and 2½	60	45

Lap Weld, double extra strong, plain ends

2	62	49½	2	56	40
2½ to 4	64	51½	2½ to 4	58	45
4½ to 6	63	50½	4½ to 6	57	44
7 to 8	57	40½	7 to 8	50	33

To the large jobbing trade an additional 5 per cent is allowed over the above discounts.

The above discounts are subject to the usual variation in weight of 5 per cent. Prices for less than carloads are two (2) points lower basing (higher price) than the above discounts on black and three (3) points on galvanized.

Boiler Tubes.—Discounts on less than carloads, f.o.b. Pittsburgh, freight to destination added, on lap welded steel tubes and standard charcoal iron tubes, effective from Oct. 29, 1915, are as follows:

Lap Welded Steel		*Standard Charcoal Iron*	
1½ in.	48	1½ in.	43 to 44
1¾ and 2 in.	60	1¾ and 2 in.	47 to 48
2¼ in.	57	2¼ in.	44 to 45
2½ and 2¾ in.	63	2½ and 2¾ in.	51 to 52
3 and 3¼ in.	68	3 and 3¼ in.	55 to 56
3½ to 4½ in.	69	3½ to 4½ in.	57 to 58
5 and 6 in.	62	5 and 6 in.	51 to 52
7 to 13 in.	59		

Locomotive and steamship special charcoal grades bring higher prices.

1¾ in., over 18 ft., 10 per cent net extra.

2 in. and larger, over 22 ft., 10 per cent net extra.

Sheets.—Makers' prices for mill shipment on sheets, of U. S. Standard gage, in carload and larger lots, on which jobbers charge the usual advance for small lots from store, are as follows, f.o.b. Pittsburgh, terms thirty days net, or 2 per cent cash discount in ten days from date of invoice:

Blue Annealed Sheets

	Cents per lb.
Nos. 3 to 8	1.95
Nos. 9 to 10	2.00
Nos. 11 and 12	2.05
Nos. 13 and 14	2.10
Nos. 15 and 16	2.20

Box Annealed Sheets, Cold Rolled

	Cents per lb.
Nos. 10 and 11	1.90 to 2.05
No. 12	1.90 to 2.05
Nos. 13 and 14	1.95 to 2.10
Nos. 15 and 16	2.00 to 2.15
Nos. 17 to 21	2.05 to 2.20
Nos. 22 and 24	2.10 to 2.25
Nos. 25 and 26	2.15 to 2.30
No. 27	2.20 to 2.35
No. 28	2.25 to 2.40
No. 29	2.30 to 2.45
No. 30	2.40 to 2.55

Galvanized Sheets of Black Sheet Gage

	Cents per lb.
Nos. 10 and 11	3.00 to 3.25
No. 12	3.10 to 3.35
Nos. 13 and 14	3.10 to 3.35
Nos. 15 and 16	3.20 to 3.45
Nos. 17 to 21	3.35 to 3.60
Nos. 22 and 24	3.55 to 3.80
Nos. 25 and 26	3.70 to 3.95
No. 27	3.85 to 4.10
No. 28	4.00 to 4.25
No. 29	4.15 to 4.40

Pittsburgh

PITTSBURGH, PA., Nov. 16, 1915.

Prices on some lines have further advanced, but without the effect of curtailing demand. Bessemer, basic and foundry pig iron are up 50c. per ton; forging billets, $3; sheets, $2 to $3; cold-rolled strip steel, $5; wire rods, $2 to $3; wire and wire nails, $1; iron bars, $2, and some grades of scrap, 50c. or more. Tin plate for 1916 has been marked up $8 per ton higher than the 1915 opening price. The mills are running to their utmost capacity, yet obligations on the books are piling up, and the matter of deliveries and getting cars is becoming more and more serious. How high prices may go time alone will tell. Advances of $3 to $5 per ton over to-day's prices are predicted by Jan. 1. Railroads continue to buy heavily. It is figured that Eastern lines are in the market for close to 25,000 cars, and a large number of cars is wanted by transcontinental lines, which are figuring with the car-builders in the West. Local steel companies say they have already sold about every ton of material they can turn out to April 1, next year, and have also sold heavily for second quarter. The recent two or three advances in prices on heavy steel products were largely made to stem the flow of orders but did not have the desired effect. Steel companies realize that prices are getting top-heavy, but say they are helpless to remedy the situation, which is without precedent. Shortages in labor are cropping out here and there, especially in the coal-mining and coke districts. An advance in coke workers' wages is looked for, to become effective Jan. 1. Reports are that in some shops machinists on piece work are making as high as $11 a day. Some advances in wages have been quietly made to forestall labor troubles.

Pig Iron.—Prices are very strong and about 50c. per ton higher. An inquiry is in the market for about 10,000 tons of basic for an Eastern consumer, and another for 5000 tons for a Cincinnati interest. A Wheeling steel interest has closed for 12,000 tons of Bessemer iron, taking the iron in exchange for steel on a conversion basis. There is still heavy inquiry for Bessemer iron from Italy, and one sale of 2000 tons has been made by a Youngstown producer at $17.50 at furnace, which is considerably above the domestic market. There has been some buying of No. 2 foundry iron for first and second quarter, and it is said that as high as $16 has been paid, but most of it went at a slightly lower price. We quote standard Bessemer iron at $16.75 to $17; basic, $16; malleable Bessemer, $16 to $16.25; gray forge, $15, and No. 2 foundry, $15.75 to $16, all at Valley furnace, the freight rate for delivery in the Cleveland and Pittsburgh districts being 95c. per ton.

Billets and Sheet Bars.—The Pittsburgh Steel Company, which has an open-hearth plant at Monessen, Pa., is said to have quietly picked up 30,000 to 40,000 tons of Bessemer billets at $26 to $26.50, delivered, the object being to release its open-hearth steel as far as possible for the purpose of making special steels, which are bringing very high prices. Forging billets have again advanced and a sale has been made of 50 tons of ordinary carbon at $48, Pittsburgh. It is said that sheet and tin-plate mills that have sliding scale contracts for sheet bars will pay about $28, maker's mill, for their bars for first quarter of 1916. A scarcity in the supply of Bessemer steel is now looming up, and it is bringing practically the same price as open-hearth. For delivery over the remainder of this year we quote: Bessemer billets, $27; open-hearth billets, $27; Bessemer sheet bars, $27, and open-hearth sheet bars, $28, all at maker's mill, Pittsburgh or Youngstown district. We quote forging billets at $48 for sizes up to but not including 10 x 10 in. and for carbons up to 0.25, the regular extras being charged for larger sizes and higher carbons. Forging billets running above 0.25 and up to 0.60 carbon take $1 per ton extra. Axle billets are held at $40 to $42.

Ferroalloys.—A Wheeling steel interest is reported to have bought 500 tons of English 80 per cent ferromanganese at about $99.50, seaboard, this price figuring $101.80, Pittsburgh, the freight rate being $2.30 per ton. Domestic 80 per cent ferromanganese is selling at about the same price as foreign. We quote English 80 per cent at $99.50 to $100, seaboard. We quote 50 per cent ferrosilicon for all of 1916 delivery as follows: Up to 100 tons, $85; up to 600 tons, $84, and over 600 tons, $83, delivered in the Pittsburgh district. Prices on Bessemer ferrosilicon are very firm as follows: 9 per cent, $22; 10 per cent, $23; 11 per cent, $24; 12 per cent, $25; 13 per cent, $26.50; 14 per cent, $28.50; 15 per cent, $30.50, and 16 per cent, $33. These prices are for delivery up to April 1, 1916, and for delivery in second quarter of next year $1 per ton advance is charged. These prices are f.o.b. furnace, Ashland, Ky., Jackson, Ohio, or New Straitsville, Ohio, each of these points having a freight rate of $2 per gross ton to Pittsburgh. We quote ferrotitanium at 8c. per lb. in carloads, 10c. in 2000-lb. lots and over, and 12½c. in smaller lots; ferrovanadium, $2.25 to $2.50 per lb. of contained vanadium.

Plates.—On Tuesday, Nov. 16, bids were to be opened in Washington, D. C., for the material for two battleships, each of which will take about 11,000 tons of hull material, 4500 tons of deck plates, and about 6000 tons of armor plates. The Pennsylvania Railroad this week opens bids in Philadelphia for 11,000 cars, and it is intimated that it may buy even a larger number. It is estimated that Eastern lines are in the market for close to 25,000 cars. Plate mills are filled up for some time ahead and prices are very strong. Mills that are able to deliver plates fairly promptly are able to obtain 1.70c. We quote ¼-in. and heavier plates at 1.60c. to 1.70c., f.o.b. Pittsburgh.

Structural Material.—The chief trouble in this trade now is to get deliveries from the mills. New inquiry is heavy and a good deal of work is being placed. The Jones & Laughlin Steel Company has taken about 600 tons for bindings and steel stacks for the three new open-hearth furnaces of the Pittsburgh Steel Company and the Riter-Conley Mfg. Company has taken 1700 tons for the building to house these furnaces. The McClintic-Marshall Company has taken 300 tons for new buildings for the Aluminum Company of America at Marysville, Tenn., 200 tons for the Pennsylvania Smelting Company, Carnegie, Pa., and 400 tons for a bridge over a dam for the Youngstown Sheet & Tube Company; American Bridge Company, 1500 tons for bridges for the Chicago, Indianapolis & Western, and 425 tons for a steel building for the National Lead & Oil Company, Parnassus, Pa.; Fort Pitt Bridge Works, 300 tons for coal sheds for the Lehigh & Wilkes-Barre Coal Company; Canton Bridge Com-

pany, a bridge across the Shenango River, 350 tons. Prices are very strong and we quote beams and channels up to 15-in. at 1.60c., f.o.b., Pittsburgh, for prompt acceptance only. It is possible an advance of $2 per ton on shapes may be made this week, as it is being considered. The demand is so heavy that the makers desire to stave off orders to some extent.

Steel Rails.—Reliable advices are that two or three trunk lines will be in the market shortly for their 1916 needs. The Carnegie Steel Company has sold 12,000 tons to the Norfolk & Western. The new demand for light rails is very active. Orders and specifications in the past week were about 4500 tons. We quote standard section rails of Bessemer stock at 1.25c., and of open-hearth stock, 1.34c., f.o.b., Pittsburgh. We quote light rails as follows: 25 to 45 lb. sections, 1.45c.; 16 and 20 lb., 1.50c.; 12 and 14 lb., 1.55c.; 8 and 10 lb., 1.60c., in carload or larger lots, 5c. per 100 lb. advance being charged for less than carload lots.

Sheets.—The new demand for all kinds of sheets is very active and most of the leading mills have few to spare for delivery over the next two or three months. Prices are steadily going up. Several large makers ask 2.40c. to 2.50c. for No. 28 Bessemer black for first quarter and sales are reported at these prices. As prices of sheet bars for first quarter will be $2 to $3 per ton higher than for this quarter, the sheet mills are cautious in booking sheet orders. For remainder of the year and first quarter delivery we quote Nos. 9 and 10 blue annealed sheets at 2c.; No. 28 galvanized, 4c. to 4.25c.; No. 28 Bessemer black, 2.25c. to 2.40c.; No. 30 black plate, tin mill sizes, H. R. & A., 2.30c. and No. 28, 2.25c. The above prices are for carload lots, f.o.b. maker's mill.

Tin Plate.—On Thursday, Nov. 11, leading makers announced that the price of tin plate for 1916 delivery would be $3.60 per base box. It is said that some contracts have already been closed at this figure, and it is known that offers of $3.40 from large consumers have been turned down by several mills. The fact that sheet bars will be much higher in the first half will no doubt have the effect of causing tin-plate mills to go slow in taking contracts at less than the announced price. The export inquiry for tin plate is heavy, with quotations out on such business as high as $3.70 per base box and it is believed that domestic mills will take this trade. We quote 14 x 20 coke plates at $3.30 to $3.40 per base box for delivery over remainder of this year, and $3.60 per base box for delivery over all of 1916.

Carwheels.—If the Pennsylvania Railroad places its expected order for 11,000 cars, it will mean 88,000 steel wheels, as it has specified such wheels almost exclusively on all its new cars for some months. The two local makers of carwheels state they are filled up for about six months. We quote 33-in. freight carwheels at $17; 33-in. tender wheels, $20; 36-in. passenger or tender wheels, $24. These prices are based on a 10-in. diameter hub, 50c. extra being charged for an 11-in. diameter hub, all f.o.b. Pittsburgh.

Railroad Spikes.—The Erie Railroad is in the market for 20,000 kegs or more. The Pennsylvania Railroad, which lately placed 175,000 tons of rails, will have inquiries out for spikes in a short time, but only part of this business will come to local makers. Makers are filled up for three or four months and prices are very firm. We quote standard railroad spikes at $1.85 per 100 lb. for delivery over remainder of this year and first quarter of 1916; small railroad and boat spikes, $1.95 for delivery into first quarter and $2 for second quarter, per 100 lb., f.o.b., Pittsburgh.

Skelp.—Local mills are booking more orders than for some time and prices are likely to be higher. We quote grooved steel skelp at 1.60c. to 1.65c.; sheared steel skelp, 1.70c. to 1.75c.; grooved iron skelp, 2c. to 2.05c., and sheared iron skelp, 2.10c. to 2.15c., all delivered to consumers' mills in the Pittsburgh district.

Wire Rods.—On a recent inquiry for 500 tons of soft rods $37 was quoted and the buyer took the rods promptly. Local makers state they have no rods to spare and have been taking care of regular customers only for some time. Export inquiry for rods is active, especially from Canada. We quote Bessemer, open-hearth and chain rods at $37 to $38, maker's mill.

Cold-Rolled Strip Steel.—An advance of $5 per ton has been made on cold-rolled strip steel. The demand is abnormally heavy, and consumers readily pay premiums over regular prices for prompt deliveries. No changes have been made in extras by local mills, but we understand several Eastern makers have revised their extras. We quote hard-rolled steel, 1½ in. and wider, under 0.20 carbon, sheared or natural mill edge, per 100 lb., $3.50 delivered. Extras are as follows:

Thickness, in.	Extras for thickness	Extras for soft or intermediate tempers	Extras for straightening and cutting to lengths not less than 24 in.
0.100 and heavier	Base	$0.25	$0.10
0.099 to 0.050	$0.05	0.25	0.15
0.049 to 0.035	0.20	0.25	0.15
0.034 to 0.031	0.35	0.40	0.25
0.030 to 0.025	0.45	0.40	0.40
0.024 to 0.020	0.55	0.40	0.50
0.019 to 0.017	0.85	0.50	1.10
0.016 to 0.015	1.25	0.50	1.10
0.014 to 0.013	1.95	0.50	1.25
0.012	2.30	0.50	coils only
0.011	2.65	0.50	coils only
0.010	3.00	0.50	coils only

Wire Products.—Effective Friday, Nov. 12, prices on all wire products were advanced $1 per ton, and the market is very strong. Mills state that premiums of $3 to $4 per ton over regular prices for plain and barb wire are readily paid by consumers for prompt deliveries. It is said that buyers of barb wire for export have recently gone to jobbers who have favorable contracts with the mills and offered as high as $10 per ton premium to have these contracts turned over to them. There is a famine in the supply of barb wire. It is predicted that wire products will be $2 per ton higher before the first of the coming year. Prices on woven wire fencing were not advanced. Prices are now as follows: Wire nails, $1.90; galvanized nails 1 in. and longer taking an advance over this price of $1.75, and shorter than 1 in., $2.25; plain annealed wire, $1.75; galvanized barb wire and fence staples, $2.75; painted barb wire, $2.05; polished fence staples, $2.05, all f.o.b. Pittsburgh, with freight added to point of delivery; terms sixty days net, less 2 per cent off for cash in ten days. Prices on woven wire fencing are 68½ per cent off list for carload lots, 67½ per cent for 1000-rod lots, and 66½ per cent for small lots, f.o.b. Pittsburgh.

Rivets.—Makers report the new demand as extraordinarily heavy and, owing to the great scarcity and high prices of raw materials, another advance in prices of rivets is not unlikely. Heavy export shipments are being made, largely to South America. We quote buttonhead structural rivets at $2.25 and conehead boiler rivets at $2.35, per 100 lb. in carload lots, f.o.b. Pittsburgh, smaller lots bringing about 10c. advance. These prices are for this year only and consumers readily pay premiums to get prompt deliveries.

Hoops and Bands.—The new demand is heavy and specifications against contracts very active. Most consumers are covered for hoops and bands at lower prices than are ruling now, and mills state they are back in deliveries four to six weeks or longer. We quote steel bands at 1.60c., with extras as per the steel bar card, and steel hoops at 1.75c., f.o.b. Pittsburgh.

Iron and Steel Bars.—There is no cessation in the heavy demand for both iron and steel bars. In the past week refined iron bars have gone up about $2 per ton. On some sizes of steel bars mills are back in deliveries 8 to 10 weeks. Heavy inquiries are still being received by local mills for steel rounds for shrapnel, but most of these are turned down, as deliveries wanted cannot be made. Two of the larger local makers of steel bars are well sold up through first quarter and have entered contracts for second quarter of 1916. We quote steel bars at 1.70c. for early delivery, 1.60c. for delivery through first quarter, refined iron bars at 1.60c., and railroad test bars, 1.70c. in carload lots, f.o.b. Pittsburgh, the usual advances being charged for small lots.

Shafting.—The new demand is very heavy, with the two local makers sold up for six months or longer.

Specifications are active and premiums of $3 to $4 per ton are said to have been offered by consumers to get prompt deliveries. Makers are back in shipments 8 to 10 weeks. We quote cold-rolled shafting at 55 per cent off in carloads and 50 per cent in less than carloads, f.o.b. Pittsburgh.

Merchant Steel.—Higher prices are practically certain. The new demand is very heavy, specifications being active and mills back in deliveries four to six weeks or longer. On small lots we quote: Iron finished tire, ½ x 1½ in. and larger, 1.80c. base; under ½ x 1½ in., 1.95c.; planished tire, 2c.; channel tire, ¾ to ⅞ and 1 in., 2.30c. to 2.40c.; 1 x ⅛ in. and larger, 2.70c.; toe calk, 2.40c. to 2.50., base; flat sleigh shoe, 2.15c.; concave and convex, 2.20c.; cutter shoe, tapered or bent, 2.70c. to 2.80c.; spring steel, 2.40c. to 2.50c.; machinery steel, smooth finish, 2.20c.

Wrought Pipe.—An advance in prices on both black and galvanized pipe is looked for in the very near future, as plates are steadily going up and spelter has also advanced. The new demand for both wrought-iron and steel pipe is heavier than for some time, and mills are now operating close to 75 per cent of capacity. Discounts given on a previous page are firmly held.

Boiler Tubes.—Makers report the new demand for locomotive and merchant tubes as very heavy, some makers being sold up on boiler tubes for three to four months. For seamless tubes the demand is unusually large, the mills being back in shipments three to four months. Very attractive export inquiries are in the market. The Shelby Steel Tube Company, Ellwood City, Pa., is rushing work on the doubling of its plant.

Nuts and Bolts.—Both domestic and export demand is still very strong. Makers say they are sold up for two to three months or longer, and are back in deliveries six to eight weeks. Heavy export shipments are being made, largely to South America. If raw materials continue to go up, prices of nuts and bolts are likely to be higher. Discounts are as follows:

Common carriage bolts, ⅜ x 6 in., and shorter and smaller, rolled thread, 75 & 10; cut thread, 75 & 5; larger or longer, 70. Machine bolts with h. p. nuts, ⅜ x 4 in., and shorter and smaller, rolled thread, 75, 10 & 5; cut thread, 75 & 10; larger or longer, 70 & 5. Machine bolts with c. p. c. t. and r. nuts, ⅜ x 4 in., and shorter and smaller, 70, 10 & 10; larger or longer, 65 & 10. Forged set screws and tap bolts, 45 & 5. Rough stud bolts, 65 & 10. Lag screws (cone or gimlet point), 80. Square nuts, h. p., tapped or blank, $5.40 off list; hexagon, $5.70 off; c. p. c. t. and r. nuts, tapped or blank, square, $4.80 off; hexagon, ⅝ in. and larger, $6.25 off; plain c. p. square nuts, $4.70 off; plain hexagon nuts, $5 off; semi-finished nuts, 80, 10 & 5. Rivets, smaller than ½ in. in diameter, 75, 10 & 10. All the foregoing prices are f.o.b. Pittsburgh, subject to an actual freight allowance not to exceed 20c. per 100 lb. on shipments of 300 lb. or more.

Coke.—Prices of standard furnace coke for prompt shipment have eased off, and it is being offered as low as $2.25 per net ton at oven, a sale of 25 cars having been made late last week at that price. A Youngstown interest has closed for about 35,000 tons of coke per month for two of its furnaces for delivery over first three months of 1916 at about $2.50 per net ton at oven, and expects to close for a similar amount for its other two furnaces within a few days. This company will be a large buyer of coal when it starts its by-product ovens. Contracts made some time ago for furnace coke on a sliding scale basis are now netting the coke producers good prices, owing to the rapid advance in the price of basic pig iron. We quote standard makes of blast furnace coke for prompt shipment at $2.25; on contracts for first half of 1916, $2.50, and for all of next year, $2.25 to $2.35 per net ton at oven. Prices on 72-hr. foundry coke are very firm and we quote $3 per net ton for prompt shipment or on contracts. The output in the upper and lower Connellsville regions for the week ended Nov. 6 was 424,162 net tons, a decrease over the previous week of about 8300 tons. This was largely due to several holidays in the coke regions, when the coke workers failed to report.

Old Material.—The advances in prices of pig iron and billets, together with heavy buying of scrap by a Youngstown interest, which took at least 25,000 tons, and also by a Cleveland interest, which is said to have bought even a larger amount, have stiffened prices on all grades of steel scrap in the local market and they are about 50c. per ton higher. Dealers paid $16 for selected heavy steel scrap, and borings and turnings are also higher. We note sales of 5000 to 6000 tons of heavy steel scrap to dealers at $16 to $16.25, also 5000 tons of turnings at about $9, delivered. Dealers quote for delivery in the Pittsburgh and nearby districts that take the same rates of freight, as follows, per gross ton:

Heavy steel melting scrap, Steubenville, Follansbee, Brackenridge, Sharon, Monessen, Midland and Pittsburgh delivery	$16.00 to $16.50
Compressed side and end sheet scrap	13.50 to 13.75
No. 1 foundry cast	14.00 to 14.25
Bundled sheet scrap, f.o.b. consumers' mills, Pittsburgh district	12.00 to 12.25
Rerolling rails, Newark and Cambridge, Ohio, Cumberland, Md., and Franklin, Pa.	15.25 to 15.50
No. 1 railroad malleable stock	13.25 to 13.50
Railroad grate bars	9.75 to 10.00
Low phosphorus melting stock	19.50 to 20.00
Iron car axles	20.50 to 21.00
Steel car axles	19.00 to 19.50
Locomotive axles, steel	19.75 to 20.25
No. 1 busheling scrap	12.50 to 12.75
Machine shop turnings	8.75 to 9.00
Old carwheels	13.00
Cast-iron borings	9.75 to 10.00
*Sheet bar crop ends	14.00 to 14.50
Old iron rails	14.00 to 14.50
No. 1 railroad wrought scrap	14.25 to 14.50
Heavy steel axle turnings	10.75 to 11.00
Heavy breakable cast scrap	12.50 to 12.75

*Shipping point.

Chicago

CHICAGO, ILL., Nov. 16, 1915.

How to care for the further needs of the trade which is accustomed to depend upon them for materials is now the problem of the steel mills. That mill is the exception which is not sold up for practically the first half or as far ahead as it cares to quote. Requests for reservations in the third quarter of next year, without condition as to price, are being received. The adjustment of supply to demand would not be so perplexing were requirements fairly well satisfied, but inquiry presses from many directions, and manufacturers see the operation of their plants in jeopardy through lack of material. Capacity of steel-making units rather than of finishing mills is the limiting factor. To remedy this inadequacy liberal plant extensions are being undertaken. At South Chicago and Gary new blast furnaces and open-hearth furnaces that will increase the ingot production of the present plants by 25 per cent are to be completed as rapidly as possible, and at Indiana Harbor similar extensions are contemplated. Little new business was booked last week, though much was offered. Orders for 60,000 tons of rails, of which 40,000 tons for the Rock Island has already been anticipated, were placed. A few additional contracts for steel for carbuilders and bridge shops were worked into the mill schedules. Demand for iron and hard steel bars, favorable delivery of which can be secured, is increasing, and prices for both have been advanced. Furnacemen here are indicating a disposition to cancel unspecified balances of pig iron where the full monthly quotas are not taken out. A more general demand from consumers for steel and rolling-mill scrap, coupled with a filling of dealers' short orders, was the occasion for a sharp advance in old material prices amounting, in some instances, to $1 per ton.

Pig Iron.—The market continues its upward trend, a further advance of 50c. per ton at Chicago furnace having been announced last week. Inquiry, while somewhat less in volume, is cropping out, some of it being of a character to suggest that a number of buyers will still have iron to buy for the first half, assuming a normal basis of operations. In general, foundries appear to be taking out iron against contracts at a normal rate. Where some melters are behind, others are anticipating shipments, largely with the intent to save as much profit as is to be had by taking in iron this

year. The holding up of shipments on the one hand and the strength of the furnace position on the other are measured by a certain amount of canceling of unspecified tonnages which has within the past week or two made its appearance. The effect of this attitude of the furnaces has for the most part been to bring about more rapid shipments, but one maker advises that quite a tonnage has been canceled. From the South there is a limited quantity of spot iron available but its sale is not attended with any particular concession. Lake Superior charcoal is up 50c. The following quotations are for iron delivered at consumers' yards, except those for Northern foundry, malleable Bessemer and basic iron, which are f.o.b. furnace, and do not include a switching charge averaging 50c. per ton:

Lake Superior charcoal, Nos. 2 to 5	$17.25
Lake Superior charcoal, No. 1	17.75
Lake Superior charcoal, No. 6 and Scotch	18.25
Northern coke foundry, No. 1	18.00
Northern coke foundry, No. 2	17.50
Northern coke foundry, No. 3	17.00
Southern coke, No. 1 f'dry and 1 soft	18.50
Southern coke, No. 2 f'dry and 2 soft	18.00
Malleable Bessemer	17.50
Standard Bessemer	18.50
Basic	16.50
Low phosphorus	$27.00 to 27.50
Silvery, 8 per cent	24.00
Silvery, 10 per cent	25.00

Rails and Track Supplies.—With the placing of 20,000 tons last week by one road and the beginning of negotiations on the part of the only other remaining trunk line which has not already been in the market, the Western rail situation appears to be approximately closed, except for small incidental tonnages. While there doubtless remains in this district mill capacity for rolling additional rail tonnage, the scarcity of raw steel is the controlling factor, the difficulty experienced by the Rock Island in placing the 40,000 tons which it purchased last week by court order amply evidencing the situation. Spikes have been again advanced, prices ruling at 1.95c. to 2c. base, Chicago, while track bolts are quoted at 2.40c. A few small orders for tie plates are noted, the business going generally to iron mills. We quote standard railroad spikes at 1.95c. to 2c., base; track bolts with square nuts, 2.40c., base, all in carload lots, Chicago; tie plates, $34, f.o.b. mill, net ton; standard section Bessemer rails, Chicago, 1.25c., base, open hearth, 1.34c.; light rails, 25 to 45 lb., 1.34c.; 16 to 20 lb., 1.39c.; 12 lb., 1.44c.; 8 lb., 1.49c.; angle bars, 1.50c, Chicago

Structural Material.—Prices at which fabricated steel continues to be taken, leaving little or no profit to the fabricator, emphasize the fact that with anything less than approximately full operation, prices will reflect a keen competition for business. In October orders were 87 per cent of shop capacity. With respect to the prices of steel on which the fabricators are now working and on which they are protected through the first half, conditions appear to be much easier in the West than in the East. Western fabricators also, while they are probably not covered in excess of 60 per cent of capacity for the first half, are much more favored in this respect than is true in the East. New building projects are of no importance. The only contracts of size placed last week were 700 tons for the Sanitary District of Chicago, taken by the American Bridge Company, a high school at Chicago, for which the Hansell-Elcock Company will furnish 450 tons, and the Thorpe warehouse at Minneapolis for which the Minneapolis Steel & Machinery Company will fabricate 300 tons. The carbuilders' problem is chief among the difficulties arising out of the present delivery situation. It would appear that in many cases figures now out on car inquiries are of necessity predicted upon the delivery of steel subsequent to July 1. Because of inability to deliver, mill quotations for plain material are largely nominal and we quote 1.789c., Chicago.

Buyers of structural material out of store have not shown much activity in taking hold at the new prices following the more liberal specifications received immediately preceding the advance. We quote for Chicago delivery of structural shapes out of stock 2.20c.

Wire Products.—The expected advance in wire products has been announced and quotations are now $1 per ton higher than last week. The trade naturally is making an effort to take advantage of its now valuable lower priced contracts by specifying heavily.

Plates.—Because of the relatively larger number of mills making plates in at least a limited range of sizes, it is not surprising to find instances of premium prices most frequent in connection with this form of finished material. While premium business does not seem likely to become as general under the present unusual conditions as has been true in the past, several orders at prices higher than 1.60c., Pittsburgh, are noted. We quote for Chicago delivery of plates from mill 1.789c.

We quote for Chicago delivery of plates out of store 2.20c.

Sheets.—With the capacity of sheet mills very generally under-sold, the position of the leading independent interest in this district, in being entirely out of the market, is interesting evidence both of the shortage of steel and the limited demand for sheets. We quote for Chicago delivery from mill, No. 10 blue annealed, 1.989c.; No. 28 black, 2.439c.; No. 28 galvanized, 3.989c.

Jobbers' prices for blue annealed sheets and black sheets have been advanced another $2 a ton and we quote for Chicago delivery from jobbers' stock as follows, minimum prices applying on bundles of 25 or more: No. 10 blue annealed, 2.40c.; No. 28 black, 2.75c.; No. 28 galvanized, 4.35c.

Bars.—That the bar-iron mills will increasingly reap the advantage attendant upon delivery conditions with respect to steel is already apparent, although tonnage as yet does not come up to mill capacity. Prices, however, have been advanced an additional $1 per ton, upon which basis the mills appear disposed to take a firm stand. A parallel situation applies with respect to hard steel bars. We quote mill shipments, Chicago, as follows: Bar iron, 1.50c.; soft steel bars, 1.789c.; hard steel bars, 1.60c.; shafting, in carloads, 58 per cent off; less than carloads, 53 per cent off.

We quote store prices for Chicago delivery: Soft steel bars, 2.10c.; bar iron, 2.10c.; reinforcing bars, 2.10c., base, with 5c. extra for twisting in sizes ½ in. and over and usual card extras for smaller sizes; shafting 45 per cent off.

Rivets and Bolts.—Conditions in the West among the rivet makers are somewhat easier than is the case in the East, and orders for Eastern delivery are in some instances being filled in this market. Orders for bolts and nuts, inspired by the recent advance, have been coming in in heavier volume than at any time in the year, and makers' quotations are being adhered to more regularly. We quote as follows: Carriage bolts up to ⅝ x 6 in., rolled thread, 75-10; cut thread, 75-5; larger sizes, 70; machine bolts up to ⅝ x 4 in., rolled thread, with hot pressed square nuts, 75-10-5; cut thread, 75-10; larger sizes, 70-5; gimlet point coach screws, 80; hot pressed nuts, square, $5.40 off per cwt.; hexagon, $5.70 off per cwt. Structural rivets, ¾ to 1¼ in., 2.25c., base, Chicago, in carload lots; boiler rivets, 10c. additional.

Prices for bolts and nuts out of stock have been advanced. We quote out of store: Structural rivets, 2.40c.; boiler rivets, 2.50c.; machine bolts up to ¾ x 4 in., 75-10; larger sizes, 70-5; carriage bolts up to ¾ x 6 in., 75-5; larger sizes, 70 off; hot pressed nuts, square, $5.75, and hexagon, $6.25 off per cwt.

Cast-Iron Pipe.—At Chicago the purchase of 20,000 tons of pipe is in contemplation, although bids have not yet been asked. At Sandusky, Ohio, 600 tons of iron sewer pipe is to be bought. We quote as follows, per net ton, Chicago: Water pipe, 4 in., $29; 6 in. and larger, $27, with $1 extra for class A water pipe and gas pipe.

Old Material.—Despite the appearance of a slight reaction at the end of last week, the earlier flurry in the scrap market carried the prices of the principal grades to markedly higher levels. The advance was sharpest for heavy melting steel and wrought scrap. A general buying of these materials by consumers inaugurated much more activity on the part of the dealers, among whom the existence of a considerable number of short orders was the signal for a stiff advance in the quotations from those with scrap to sell. Until consumers again find that their requirements are being well covered by incoming shipments, the upward tendency of the market will doubtless continue, although even now the scale of prices is relatively high as compared with other markets. New railroad offerings of scrap, listed this week, total about 3000 tons, distributed among lists

of no separate consequence. We quote for delivery at buyers' works, Chicago and vicinity, all freight and transfer charges paid, as follows:

	Per Gross Ton	
Old iron rails	$15.00 to	$15.50
Relaying rails	19.50 to	20.50
Old carwheels	13.25 to	13.75
Old steel rails, rerolling	14.25 to	14.50
Old steel rails, less than 3 ft	14.25 to	14.50
Heavy melting steel scrap	13.50 to	14.00
Frogs, switches and guards, cut apart	13.50 to	14.00
Shoveling steel	13.25 to	13.50
Steel axle turnings	9.50 to	10.00
Per Net Ton		
Iron angles and splice bars	$15.25 to	$15.75
Iron arch bars and transoms	16.00 to	16.25
Steel angle bars	12.50 to	13.00
Iron car axles	18.00 to	18.50
Steel car axles	19.00 to	19.50
No. 1 railroad wrought	13.25 to	13.75
No. 2 railroad wrought	12.25 to	12.75
Cut forge	12.25 to	12.75
No. 1 busheling	11.00 to	11.50
No. 2 busheling	8.25 to	8.75
Pipes and flues	10.00 to	10.50
Steel knuckles and couplers	13.00 to	13.50
Steel springs	13.75 to	14.25
No. 1 boilers, cut to sheets and rings	9.75 to	10.25
Boiler punchings	12.25 to	12.75
Locomotive tires, smooth	12.25 to	12.75
Machine shop turnings	7.50 to	8.00
Cast borings	6.50 to	7.00
No. 1 cast scrap	12.00 to	12.50
Stove plate and light cast scrap	9.50 to	10.00
Grate bars	9.50 to	10.00
Brakeshoes	9.00 to	9.25
Railroad malleable	11.50 to	12.00
Agricultural malleable	10.00 to	10.50

Philadelphia

PHILADELPHIA, PA., Nov. 16, 1915.

A most striking feature of the situation is the great irregularity of prices throughout the entire market. This, of course, is to be expected with the heavy demand and the withdrawal of many manufacturers who find they are overloaded with orders for one or more products. This condition has prevailed for the last few weeks, but is now more acute. Structural shapes are scarcer than ever and high premiums are willingly paid. Most of the bar makers are out of the market. Plates are more easily obtainable than shapes or bars, but also command fancy prices. Quotations for billets and blooms are difficult to gage, so wide is the range of quotations. Some good-sized lots of foundry iron have been taken, along with a good aggregate of small lots. Virginia iron looms up relatively more strong and active than eastern Pennsylvania. A sale of basic has been made at $18 for next year's delivery. Low phosphorus continues active, with several thousand tons sold at over $30. Coke is strong and old material is firm.

Pig Iron.—Most of the inquiries for good round tonnages which were referred to a week ago have been closed, as well as a considerable number of smaller ones. Interest continues to center to a notable extent in Virginia iron. As heretofore stated, one Virginia producer has practically withdrawn from the market, its activity being confined to deliveries and disposing of a few small lots of No. 2 X to regular and insistent customers who paid $15, furnace, or $17.75, Philadelphia. A second producer having No. 2 plain only is quoting $14.50, furnace, or $17.25, Philadelphia, for this year, and 50c. more—$17.75, Philadelphia, for first half of next year. Still another Virginia maker quotes $15.50, furnace, or $18.25, Philadelphia, for first quarter for No. 2 X, and $15.25, furnace, or $18, Philadelphia, for No. 2 plain, and contemplates a further advance of 50c. next week. In the past few days about 35,000 tons of pipe iron has been taken by interests at Lynchburg, Va. New England consumers also have taken large quantities of Virginia iron. The movement in eastern Pennsylvania foundry iron, apart from the few good-sized lots already referred to, has been fair, though mostly confined to quantities of 200 to 500 tons. The foundry business is busier, and consumers are asking that shipments be hurried and in some cases that they be forwarded ahead of contract time. The Norfolk & Western Railroad was supposed to have filled its first quarter requirements, but is in the market for an additional 1000 tons. Eastern Pennsylvania No. 2 X is obtainable at $16.50, furnace, or $17.29, Philadelphia, delivery this year, and at $17, furnace, or $17.79, Philadelphia, for first quarter. Other quotations are $17.50, Philadelphia, and $17.84, Philadelphia, for this year, and into the first quarter. Activity in basic has been limited to a few sales. For about 9000 tons of first half delivery, $18, delivered, was paid, and another lot of 1500 tons was taken by a Delaware consumer, delivery to be from western Pennsylvania. The activity in low phosphorus continues, one interest taking a block of 7500 tons at a figure slightly in excess of $30, delivered. Small lots, about making up an equal amount, have been taken at the same price or higher. Lebanon iron is quoted at $27 to $28, furnace, and at the lower prices a few hundred tons have been sold. The local representative of a maker of Southern iron quotes No. 2 at $14, Birmingham, but no business has been done on that basis. Quotations for standard brands, delivered in buyers' yards, shipment this year, range about as follows:

Eastern Penna., No. 2 X foundry	$17.25 to $17.75
Eastern Penna., No. 2 plain	17.00 to 17.50
Virginia, No. 2 X foundry	17.75 to 18.25
Virginia, No. 2 plain	17.25 to 17.75
Gray forge	16.00 to 16.25
Basic	17.50 to 17.75
Standard low phosphorus	29.00 to 30.00

Iron Ore.—Arrivals of foreign ore at this port in the week ended Nov. 13 consisted of 6000 tons from Spain and 4750 tons from Cuba.

Ferroalloys.—No change is apparent in the situation with regard to 80 per cent ferromanganese. The quotation is $100, seaboard, for future deliveries. About 16,000 tons of manganese ore is reported to be en route from India to an eastern Pennsylvania steel company.

Bars.—Leading makers are not quoting on steel bars, as well as on some other products. The nominal quotation has been 1.759c., Philadelphia, to which premiums are added. Iron bars, in carload lots, are quoted from 1.759c. to 1.809c., Philadelphia.

Plates.—On prompt deliveries a leading eastern Pennsylvania maker quotes 1.85c., Pittsburgh, or 2.009c., Philadelphia, while for first quarter his minimum quotation is 2c., Pittsburgh, or 2.159c., Philadelphia. Another maker quotes prompt at 1.70c., Pittsburgh, or 1.859c., Philadelphia, and first quarter at 1.90c. to 2c., Pittsburgh, or 2.059c. and 2.159c., Philadelphia, respectively. Others say that while business is freely offered at 1.759c., Philadelphia, makers can without difficulty get 1.859c. Plates unquestionably are easier than shapes and bars when the whole field is viewed. Business continues to come from all directions.

Structural Material.—Shapes are more than ever difficult to procure. The minimum quoted by one eastern Pennsylvania mill is 1.859c., Philadelphia, based on 1.70c., Pittsburgh, while for miscellaneous lots, 1.85c. to 2c., Pottsville, are obtained. The railroads are buying steadily, but quietly. The Fort Pitt Bridge Works will supply 200 tons of material for lumber sheds to be erected for the Lehigh & Wilkes-Barre Coal Company, Ashley, Pa. An eastern Pennsylvania mill will supply 7000 tons for the Frankford elevated line, for which the McClintic-Marshall Company has the contract. The contract for the Consolidated Gas & Electric Company's office building at Baltimore, to take about 3000 tons, was awarded to the American Bridge Company. Small propositions are fewer.

Billets.—Quotations cover a very wide range and fancy prices are being paid for both rerolling and forging billets. An eastern Pennsylvania mill gives its minimum for open-hearth soft rerolling billets as $34, delivered, although admitting that sales have been made up to $50. The same maker gives the minimum for forging billets at $42. One mill quotes forging steel at $48. Business has been declined by several mills, some of them being completely out of the market. The export inquiry is strong.

Sheets.—The quotation for No. 10 blue annealed sheets has been advanced to 1.90c., Pittsburgh, or 2.059c., Philadelphia. The demand is good.

Coke.—Furnace coke has been active in Virginia in the past few days, at least 50,000 tons having been taken for delivery next year at prices ranging from $2.65 to $3 per net ton at oven, deliveries to be made from the New River, Pocahontas or Clinchfield fields. The eastern Pennsylvania market is strong. Prompt

furnace is quoted at $2.75 to $3 per net ton at oven and contract at $2.50 to $2.75. Both prompt and contract foundry are quoted at $3 to $3.25 per net ton at oven. Freight rates from the principal producing districts follow: Connellsville, $2.05; Latrobe, $1.85, and Mountain, $1.65.

Old Material.—There is slightly more inquiry, but otherwise the market is unchanged. It is strong. The railroad lists went at a high figure. Some low phosphorus scrap from Pittsburgh and the Central South has lately been taken by local consumers. Quotations for delivery in buyers' yards in this district, covering eastern Pennsylvania and taking in freight rates from 35c. to $1.35 per gross ton, are as follows:

No. 1 heavy melting steel	$14.50 to $15.00
Old steel rails, rerolling	16.00 to 16.50
Low phos. heavy melting steel scrap	20.00 to 20.50
Old steel axles	21.00 to 22.00
Old iron axles	22.00 to 23.00
Old iron rails	17.50 to 18.00
Old carwheels	14.00 to 14.50
No. 1 railroad wrought	16.00 to 16.50
Wrought-iron pipe	13.50 to 14.00
No. 1 forge fire	12.00 to 12.50
Bundled sheets	11.50 to 12.00
No. 2 busheling	9.50 to 10.00
Machine shop turnings	10.00 to 10.25
Cast borings	10.00 to 10.50
No. 1 cast	14.50 to 15.00
Grate bars, railroad	10.50 to 11.00
Stove plate	10.50 to 11.00
Railroad malleable	10.50 to 11.00

Buffalo

BUFFALO, N. Y., Nov. 16, 1915.

Pig Iron.—Bookings have not been so large as last week, because some producers are practically out of the market. Having taken on all the business they wish to carry over the first quarter, they desire to keep open a part of their first half output for the higher prices expected. Interest of consumers is growing and some buyers are apparently anxious as to their future supplies. Shipment demand on contracts continues to be of tremendous volume for all grades, taxing the capacity of the largest producers. Some furnaces report the volume of specifications to be double that of output capacity. Prices show a stiffening tendency from day to day, and further advances seem imminent. One producer has withdrawn all prices under $17 for shipment over first half, having only a limited unsold tonnage of ordinary grades, and no high silicon or Scotch iron whatever. Demand for special irons, such as high silicon silvery, Bessemer ferrosilicon and low phosphorus iron is very heavy, the largest ever experienced in this market, and if continued will soon exhaust the available supply. One sale of high grade iron is just reported at nearly $35 per ton, at furnace in Ohio. The demand for all grades of coke is also very heavy with upward trend in prices which change almost daily. Good grades of foundry coke for prompt shipment are now quoted at $3.25 at ovens. We quote as follows, for current and first quarter delivery, f.o.b. furnace, Buffalo:

Foundry of 4 to 5 per cent silicon	$17.50
No. 1 foundry	17.00
No. 2 X foundry	$16.50 to 16.75
No. 2 plain	16.50
No. 3 foundry	16.50
Gray forge	16.50
Malleable	16.50 to 16.75
Basic	17.00
Charcoal—regular brands and analysis	18.00 to 19.00
Charcoal—special brands and analysis	21.00 to 22.00

Finished Iron and Steel.—Interest centers in the question of shipment rather than in that of sales. No contracts are being solicited. Practically all inquiries for additional tonnage are being considered individually and only the most pressing needs of regular customers are being favored. Prices quoted are only nominal, 1.60c., Pittsburgh, for bars, plates and shapes, and orders are not accepted except for shipment at mills' convenience. It is understood that many of the smaller buyers are placing round tonnages with jobbers because of their inability to secure at first hand from the mills, and the jobbers are already commencing to limit their sales on direct shipment, feeling that they will need all of their unspecified contracts to take care of their stock shipment business. The season's prices established for tin plate, announced last week, are receiving consideration of buyers and it is understood some contracts have been closed, the sharp advance in pig tin making buyers look more favorably upon the 3.60c., base, per box price than if the advanced price had been announced a week earlier. There has been a further advance of 5c. per 100 lb. in wire products and in fine wire of $5 per ton. Sub-bids for steel for the Morrow Mfg. Company, Elmira, N. Y., are to be taken by the Compton Real Estate Company, which has the general contract. The Ferguson Steel & Iron Company, Buffalo, has 150 tons for the Schoellkopf Aniline & Chemical Company, this city, for which the John W. Cowper Company has the general contract. George Baker Long, Worcester, Mass., is low bidder for the new City Hospital buildings, Buffalo, 700 tons.

Old Material.—Demand continues strong, with sales of good-sized tonnages in most lines. Prices have advanced materially for many commodities, particularly heavy melting steel, low phosphorus steel, wrought scrap, iron axles, railroad malleable, heavy axle turnings, wrought pipe and bundled sheet scrap. We quote dealers' asking prices, per gross ton, f.o.b. Buffalo, as follows:

Heavy melting steel	$14.00 to $15.00
Low phosphorus steel	18.50 to 19.00
No. 1 railroad wrought scrap	13.50 to 14.00
No. 1 railroad and machinery cast	13.75 to 14.25
Old steel axles	19.00 to 19.50
Old iron axles	20.00 to 20.50
Old carwheels	13.50 to 14.00
Railroad malleable	13.50 to 14.00
Machine shop turnings	6.50 to 7.00
Heavy axle turnings	11.00 to 11.50
Clean cast borings	7.50 to 7.75
Old iron rails	16.00 to 16.50
Locomotive grate bars	10.50 to 11.00
Stove plate (net ton)	9.00 to 9.50
Wrought pipe	11.50 to 12.00
Bundled sheet scrap	10.50 to 11.00
No. 1 busheling scrap	11.00 to 11.50
No. 2 busheling scrap	9.50 to 10.00
Bundled tin scrap	10.00

Cleveland

CLEVELAND, OHIO, Nov. 16, 1915.

Iron Ore.—The buying movement for 1916 will probably not be deferred more than two or three weeks and may start any day, although most shippers hope the market will not open up until they are through with this season's shipments. There is more talk about the advance of $1 per ton in ore prices than there has been previously and the feeling is quite general that the advance will be more than 50c. a ton. Blast-furnace men who are selling pig iron for delivery through the second quarter will be glad to have the uncertainty regarding ore prices cleared up. Lake carrying charges for 1916 have been established at an advance of 10c. over this year making the rate 50c. from the head of the lakes, 45c. from Marquette and 35c. from Escanaba, an advance of 5c. more than was expected. Following the fixing of ore-rates last week there has been very heavy vessel chartering, and the bulk of the lake carrying capacity is tied up for the coming season. Boat schedules have been very badly interfered with during the past few days by storms on the lakes, and as a result the November movement will be lighter than expected and considerable ore will be brought down in December. We quote 1915 prices as follows delivered the lower Lake ports: Old Range, Bessemer, $3.85, Mesaba Bessemer, $3.45, Old Range non-Bessemer, $3, and Mesaba non-Bessemer, $2.85.

Pig Iron.—The market is less active than during the previous few weeks but prices continue to go upward. The Cleveland price on foundry iron is 50c. a ton higher at $16.50 at furnace for local delivery but possibly $16 would be quoted for outside shipment. Prices have stiffened in the Valley where it is doubtful if $16 can now be shaded, and one interest is holding its iron for $17. In Toledo foundry and malleable iron has advanced to $16.50. Some small lot sales of Southern iron are reported at $13.50, Birmingham, for No. 2 for early shipment and contract. The $13 price for early shipment has disappeared. Ohio silvery iron is active and very scarce for early delivery. The price has been further advanced $1 per ton. We note the sale of a 500-ton lot of 9 per cent silicon iron for December shipment at $23.50 at furnace. One inquiry is pending for 5000 ton lots of low phosphorus iron for

the first half and one for 1000 ton. We quote delivered Cleveland as follows:

Bessemer	$17.45 to $17.95
Basic	16.80
Northern No. 2 foundry	16.80
Southern No. 2 foundry	17.50 to 18.00
Gray forge	16.30
Jackson County silvery 8 per cent Silicon	23.62 to 24.62
Standard low phos., Valley furnace	29.00

Finished Iron and Steel.—Sharp price advances have been made by mills that are able to take orders for early delivery, this being particularly true of plates. A local mill has advanced its price on plates to 2c., Pittsburgh, and has declined to take first quarter contracts at that price. Plate sales during the past few days represent a range in prices from 1.65c. to 2c., Pittsburgh, but 1.85c. to 1.90c. now appears to be about the minimum price for early delivery. For extended future delivery leading mills continue to quote steel bars, plates and structural material at 1.60c., Pittsburgh. The demand continues heavy and some of the mills are entirely out of the market, being sold up through the first quarter or longer. Hard steel bars have been advanced $2 per ton to 1.50c., Pittsburgh, and the demand has improved materially owing to the inability of consumers to secure soft steel bars. In structural lines there is a good deal of work coming out requiring from 100 to 200 tons, and among new projects that have developed is the rebuilding of the Boody House in Toledo that will require 3500 tons. The scarcity of forging billets continues, and these have been quoted as high as $50 at Eastern mill for early delivery. Sheet prices are very firm and higher. Blue annealed sheets are quoted at 2c. to 2.20c. at mill, for No. 10 some first-quarter business being taken at the latter price. Black sheets are quoted at 2.20c. to 2.35c. and higher for No. 28 and galvanized at 3.75c. to 4c. for No. 28. We quote bar iron at 1.50c., Cleveland. Warehouse prices are 2.25c. for steel bars under 2 in., 2.50c. for 2 in. and larger and 2.35c. for plates and structural material.

Coke.—There is some demand for spot foundry coke from foundries that, owing to an improvement in business, did not contract for their present requirements. We quote standard Connellsville foundry coke at $3 to $3.25 per net ton at oven for prompt shipment and contract. However, some producers are asking $3.50 for contract. Furnace coke is quoted at about $2.35 to $2.50 for prompt shipment for the first half.

Old Material.—Corrigan, McKinney & Co. are a new buyer of scrap, having come in the market for 2000 tons of heavy melting railroad steel. This firm may get its new steel plant in operation shortly before January. The market is fairly active and prices are very firm. Mills are well supplied with scrap for this year but are in the market for material for delivery in January and February, and some heavy melting steel scrap is understood to have been sold as high as $15 to a local mill for future delivery. The price on heavy steel scrap for Cleveland delivery has been advanced fully $1 per ton and several other grades are higher. We quote, f.o.b. Cleveland, as follows:

Per Gross Ton

Old steel rails	$14.00 to $14.25
Old iron rails	14.50 to 15.00
Steel car axles	21.00 to 22.00
Heavy melting steel	14.50 to 14.75
Old carwheels	12.25 to 12.50
Relaying rails, 50 lb. and over	22.50
Agricultural malleable	11.50 to 12.00
Railroad malleable	13.75 to 14.00
Steel axle turnings	11.50 to 12.00
Light bundled sheet scrap	11.75 to 12.00

Per Net Ton

Iron car axles	$17.25 to $17.75
Cast borings	6.75 to 7.00
Iron and steel turnings and drillings	6.25 to 6.50
No. 1 busheling	11.50 to 11.75
No. 1 railroad wrought	12.75 to 13.25
No. 1 cast	11.25 to 11.75
Railroad grate bars	9.50
Stove plate	9.25 to 9.50

Bolts, Nuts and Rivets.—The bolt and nut market is very firm and a further advance of 5 to 10 per cent in prices is expected before the end of the week. The demand is active, but some makers are declining to make additional contracts for the first quarter owing to the advance in steel prices. Rivet consumers are taking contracts for the first quarter at regular prices which are very firm. We quote rivets at 2.25c., Pittsburgh, for structural and 2.35c. for boiler rivets. Bolt and nut discounts are as follows:

Common carriage bolts, ⅜ x 6 in., smaller or shorter, rolled thread, 75 and 10 per cent; cut thread, 75 and 5, larger or longer, 70; machine bolts with h.p. nuts, ⅜ x 4 in., smaller or shorter, rolled thread, 75, 10 and 5; cut thread, 75 and 10, larger and longer 70 and 5; lag bolts, gimlet or cone point, 80; square h.p. nuts, blank or tapped, $5.40 off the list; hexagon h.p. nuts, blank or tapped, $5.70 off; c.p.c. and T-square nuts, blank or tapped, $4.80 off; hexagon nuts, all sizes, $6.25 off; cold pressed semi-finished hexagon nuts, all sizes, 80, 10 and 5 off.

Cincinnati

CINCINNATI, OHIO, Nov. 17, 1915.—(*By Wire.*)

Pig Iron.—Although inquiries are somewhat scarce, and no business of consequence is being done for this year's shipment, quite a satisfactory tonnage of both Southern and Northern foundry iron has been disposed of for delivery in the first and second quarters of next year. Two Indiana melters bought respectively 500 and 1500 tons of Northern foundry iron for first half. Other scattered sales of Northern foundry and malleable have been made to consumers in central and southern Ohio. Northern foundry malleable and basic have been advanced to $16.50, Ironton, for either prompt or first half movement. A central Ohio firm took 500 tons of malleable for shipment before April 1 and for the same delivery a like quantity of Southern foundry iron was taken by a northern Ohio consumer; also about 600 tons was bought locally. Southern iron is very much firmer, and no furnace iron can be obtained below $13.50, Birmingham basis, for either prompt or first quarter shipment. However, a limited tonnage of resale iron is being quietly offered at $13 for prompt movement. Practically no Southern iron has been sold lately for this year's shipment and all recent transactions are for delivery next year. First half quotations range from $13.50 to $14 and considerable business has been booked at the higher figure. One interest is asking $14.50, but has made no contracts at this price. Inquiries for foundry iron include one for 500 tons of Southern iron for an Ohio melter and another for 1000 tons of malleable for a southern Illinois manufacturer. Ohio Silvery iron has again been advanced, and $22.50 at furnace is now minimum for either prompt or first quarter shipment, and one producer is asking $24. A sale of 700 tons of silvery iron was made to a Michigan buyer last week and quite a number of small lots went to different consumers in Ohio and Indiana. Basic iron for nearby shipment is practically unobtainable. Based on freight rates of $2.90 from Birmingham and $1.26 from Ironton, we quote, f.o.b., Cincinnati, as follows:

Southern coke, No. 1 f'dry and 1 soft.	$16.90 to $17.40
Southern coke, No. 2 f'dry and 2 soft.	16.40 to 16.90
Southern coke, No. 3 foundry	15.90 to 16.40
Southern No. 4 foundry	15.40 to 15.90
Southern gray forge	14.90 to 15.40
Ohio silvery, 8 per cent silicon	23.26 to 23.76
Southern Ohio coke, No. 1	18.76 to 19.26
Southern Ohio coke, No. 2	17.76 to 18.26
Southern Ohio coke, No. 3	17.26 to 17.76
Southern Ohio malleable Bessemer	17.76 to 18.01
Basic, Northern	17.76 to 18.01
Lake Superior charcoal	17.70 to 18.70
Standard Southern carwheel	24.40 to 24.90

(*By Mail*)

Coke.—Connellsville quotations are especially strong, and prompt shipment prices are somewhat higher than contract business. While it is possible that some prompt 48-hr. coke might be purchased around $2.50 per net ton at oven, producers are generally asking more. Contract figures range from $2.40 to $2.75. Foundry coke is quoted around $2.85 to $3.25 at oven for future shipment, with the prompt quotation at $3 to $3.25. Wise County and Pocahontas prices are now about on the same level as Connellsville. Not much business in either furnace or foundry coke is reported in this territory, although a number of contracts for the latter are pending. The foundries are taking coke due on contracts as fast as it

is shipped, and so far no serious complaints have arisen as to a car shortage.

Finished Material.—At least one mill in this vicinity is holding No. 28 galvanized sheets at 4.25c., Pittsburgh basis, an advance of 50c. per ton over last week's quotation. There is a rapidly increasing demand for sheet bars as well as for black sheets, and this condition, coupled with the high price of spelter, makes the galvanized sheet business comparatively unattractive for the producers. However, the mills are making special efforts to take care of old customers and are succeeding fairly well in keeping delivery promises. No. 28 black sheets are quoted to-day around 2.35c., Pittsburgh basis. The local store quotation on black sheets ranges from 2.40c. to 2.50c., with only a limited quantity obtainable at even the advanced figure named. Galvanized sheets, from stock, can be obtained to-day as low as 4.35c., but an advance is scheduled before the end of the week. Steel bars are quoted by local jobbers at 2.25c., and small structural shapes at 2.35c. Reinforcing twisted concrete bars, ¾ in. and larger, are around 2.40c. to 2.45c. We quote to-day cold-rolled shafting from stock at 44 per cent off list for rounds and 42 per cent off for squares and hexagons. A very good business is reported in both reinforcing concrete bars and structural shapes.

Old Material.—The market continues very firm, with steel scrap in excellent demand. Stove plate is also improving. Although no general price advances have been made, a few dealers have marked up different kinds of scrap material. The minimum figures given below represent what buyers are willing to pay for delivery in their yards, southern Ohio and Cincinnati, and the maximum quotations are dealers' prices f.o.b. at yards:

Per Gross Ton

Bundled sheet scrap	$9.50 to $10.00
Old iron rails	13.25 to 13.75
Relaying rails, 50 lb. and up	21.00 to 21.50
Rerolling steel rails	12.25 to 12.75
Heavy melting steel scrap	11.25 to 11.75
Steel rails for melting	11.25 to 11.75

Per Net Ton

No. 1 railroad wrought	$10.25 to $10.75
Cast borings	6.75 to 7.25
Steel turnings	6.25 to 6.75
Railroad cast scrap	10.75 to 11.25
No. 1 machinery cast scrap	12.25 to 12.75
Burnt scrap	7.75 to 8.25
Old iron axles	16.50 to 17.00
Locomotive tires (smooth inside)	10.50 to 11.00
Pipes and flues	8.00 to 8.50
Malleable and steel scrap	9.25 to 9.75
Railroad tank and sheet scrap	7.25 to 8.50

San Francisco

SAN FRANCISCO, CAL., Nov. 9, 1915.

While general business conditions are improving, the local steel trade continues rather quiet. About the only real activity, aside from the foreign demand, appears in the effort of merchants and some of the largest consumers to provide for requirements of the more or less distant future, in view of the increasing difficulty in obtaining deliveries and the prospect of even higher prices. The advance has caused a better feeling among merchants, and resale prices are keeping pace with those in the East. Foreign inquiries for all finished products are numerous, but the movement is hampered by lack of ships.

Bars.—The local steel bar mills, as well as the few at other points on the Pacific coast, now have enough business to take their full output for some time to come. The tonnage is largely, though by no means entirely, for export. More orders are accordingly going to Eastern mills, and prices show a further advance, the latest figure from the East being 1.60c., Pittsburgh, while local mills are holding firmly to 2c. for future delivery, and jobbers' carloads from the local warehouse are quoted at 2.25c. Immediate needs here are light, but buyers are disposed to contract as far into next year as possible, and specifications on fourth quarter contracts are fairly large.

Structural Material.—No fabricating contracts of special importance have transpired, and the amount of building on which figures are now being taken is small. The outlook, however, is more encouraging, as plans are under way for a considerable number of small apartment houses, and interest in building throughout the State appears to be reviving. More plain material is being purchased for future needs than for some time.

Plates.—Little new can be reported in the way of large tank or shipbuilding contracts, but the principal manufacturers in these lines are very busy, and an unusually large tonnage is required for work already on hand. There is a general movement to cover first quarter requirements, and business is said to have been placed as high as 1.60c., Pittsburgh.

Sheets.—Jobbing trade is very quiet, the seasonable activity in corrugated sheets being about over. Merchants are specifying a little more freely, in view of retarded deliveries, but are not disposed to put in very large stocks for the winter months, as there is no immediate prospect of larger requirements.

Wrought Pipe.—The demand in the oil fields has narrowed again, after a little spurt, and the advance on black pipe has caused no perceptible change in the situation. Plumbing supply houses note a little better outlook, but actual sales have not yet increased greatly, and merchants prefer to wait until after the close of the year to increase their stocks.

Cast-Iron Pipe.—No municipal business worth mentioning has been placed in the last fortnight, and important inquiries are lacking. Figures are being taken, however, on a fair tonnage of flange pipe for several oil refinery projects, and some small gas pipe orders are expected shortly. Prices are firm at the former level namely, $32 per net ton for 6-in., $34 for 4-in., and $1 extra for class A and gas pipe, San Francisco.

Pig Iron.—Local foundry requirements are increasing somewhat, and spot offerings of foreign iron are getting down to narrow limits, in view of which prices are firmly held. New business in Southern iron consists mostly of scattered carloads, though a few new contracts are coming out. No. 1 Southern foundry iron is quoted here at $23.50 to $24 per net ton.

Coke.—Offerings of spot foreign coke are getting pretty well cleaned up. While some consumers still have a fair stock, interest in domestic coke is gradually increasing. The principal Eastern makes are quoted at $15 to $15.50 per net ton, and importers are asking $15 to $16 per net ton, ex yard.

Old Material.—The local demand for steel melting scrap is about at its height, with prospects of continued activity for some months, and most of the dealers are accordingly holding their prices very firmly. On the other hand, some of the principal consumers have large supplies, and there are still many scattered lots to be found in the country. Prices may be quoted approximately at a general range of $7 to $10 per gross ton. There is a fair demand for cast scrap, which is rather firmly held in sympathy with the advancing prices of pig iron, various grades being quoted at a range of $14 to $16 per net ton.

Birmingham

BIRMINGHAM, ALA., Nov. 15, 1915.

Pig Iron.—The majority of sales made in the week ended Nov. 13 were on the basis of $13.50, although some business was done at $14. The Republic Company sold 3000 to 5000 tons for Southern 1916 delivery and a 1000-ton and other lots for Northern 1916 delivery at $14, that being its only price. It is very well sold into next year. The leading interest has done considerable booking at $13.50. It has no spot iron to offer and all sales were for 1916, as far as through the first half. Spot is as strong as forward iron, owing to the heavy bookings against capacity. This week the Sloss-Sheffield Company will add a fifth active stack, to do which it has been forced to secure coke from the Pratt Consolidated Coal Company and others. The Tennessee Company's fourth Bessemer stack will resume very soon and this will provide considerably more foundry for sale. That company at the close of the week manifested no disposition to advance to $14. The market was featured by the sale of a considerable tonnage by the Alabama Company of its Clifton

high silicon iron at $15 and $16. This concern has booked half of its capacity as far ahead as next July. Its second stack at Ironaton making Clifton iron will be ready by Jan. 15. Stocks did not decline in November when the output showed an increase of 25,000 tons over all prior records, but makers express no concern over this. Reductions this month are expected. Southern foundry takings have greatly increased and the outlook in that line, especially with pipe makers, is for a large consumption during the entire winter. Charcoal iron continues brisk at the advanced figures. Sales of foundry into Chicago territory are reported as facilitated by the recent advances in Chicago made iron. We quote, per gross ton, f.o.b. Birmingham district furnaces, as follows:

No. 1 foundry and soft	$14.00 to $14.50
No. 2 foundry and soft	13.50 to 14.00
No. 3 foundry	13.00 to 13.50
No. 4 foundry	12.75 to 13.25
Gray forge	12.50 to 13.00
Basic	13.50 to 14.00
Charcoal	22.00 to 22.50

Cast-Iron Pipe.—Specifications for pipe from municipalities have been more numerous than expected, the past week having been quite brisk from a new business standpoint. Gretna, La., ordered 1000 tons of 4-in. and upward. Prices are firm at the advance. We quote, per net ton, f.o.b. makers' yards, as follows: 4-in., $23.50; 6-in. and upward, $21.50, with $1 added for gas pipe.

Coal and Coke.—Coal is rapidly falling in with the progressive march of other industrial products. Several railroad systems have already ordered a 50 per cent increase in monthly takings in November, a larger quantity in December and maximum amount in January and thence forward. Coke is strong, the increased output being in steady demand, with prices firm and in some cases advanced. The Alabama Consolidated Coal Company will relight its Newcastle beehive ovens to supply the Sloss-Sheffield Company. The general foundry demand from all over the South and Southwest has increased. Additional orders for coke for the Mediterranean are offering, but none has been taken since the recent booking of one for 1000 tons spot delivery. We quote, per net ton, f.o.b. oven, as follows: Beehive furnace, $2.75 to $3; beehive foundry, $3.25 to $3.50; by-product furnace, $2.50 to $2.75; by-product foundry, $2.75 to $3.

Old Material.—Dealers report a satisfactory business. The movement of scrap to steel plants is quite active. Stocks on hand are moderate. We quote, per gross ton, f.o.b. dealers' yards, as follows:

Old iron axles	$14.50 to $15.00
Old steel axles	14.00 to 14.50
Old iron rails	13.50 to 14.00
No. 1 railroad wrought	10.50 to 11.00
No. 2 railroad wrought	9.50 to 10.00
No. 1 country wrought	9.00 to 9.50
No. 1 machinery cast	10.00 to 10.50
No. 1 steel scrap	10.00 to 10.50
Tram carwheels	10.00 to 10.50
Stove plate	8.00 to 8.50

St. Louis

ST. LOUIS, MO., Nov. 15, 1915.

Pig Iron.—Foundries are developing a tendency to contract farther ahead for pig iron, but the movement has not yet reached particularly large proportions. The disposition is still largely to play safe and let the ultimate consumer stand the increased cost resulting. However, there is very little delay in closing such transactions as are made, it having become apparent through experience that quoted prices are very likely to be withdrawn summarily. Lake Superior charcoal iron has been active, but the sales have all been small individually, with advances generally noted over previous week's prices. Difficulty is reported in securing shipment of some grades and brands of iron, with more frequent appearance of substitution where the iron is imperatively needed. Several sales of No. 2 Northern foundry are reported of 300 tons and below, and one of 150 tons of high silicon iron; also a considerable number of sales of No. 2 Southern of about the same tonnage, with one of 600 tons and one of 1000 tons. The aggregate for the week was about on a par with similar recent periods. One inquiry still outstanding is for 1500 tons of malleable, also one for 1000 tons of carwheel iron.

Coke.—With the stiffening of the Connellsville and Virginia figures for beehive coke, the local by-product plant has strengthened its price and is quoting $5.80 per net ton, delivered St. Louis, which compares with $3 Connellsville plus $2.80 freight on 72-hr. selected foundry coke. This figure, however, would be shaded in competition. Demand for shipment on contract is increasing.

Finished Iron and Steel.—The demand for finished products continues to increase, but buyers are still basing their contracts on actual business rather than preparing their stocks against future demand. However, there has been an increasing tendency to look after the future, as the fabricators report more business coming out and in actual sight with indications from the architects of still further requirements. The activity applies to structural material, ordinary and reinforcing bars and to some extent to plates, though these are not in so active demand as the other materials. In standard section steel rails one inquiry is pending for about 2800 tons and two others for about 500 tons each, one of these being a duplication of a previous contract. Approval Saturday by the United States District Court of the expenditure of about $500,000 for rails for the Missouri Pacific by the receiver and about $200,000 for rails for the Iron Mountain is likely to bring a large inquiry into the market shortly. Light rails are moving freely to the coal mines and at higher prices. The lumber roads are not now actively in the market. Track fastenings are in good demand. Movement of stock out of warehouse is very good, the advanced prices having had little effect in checking demand. We quote for stock out of warehouse as follows: Soft steel bars, 2.15c.; iron bars, 2.10c.; structural material, 2.25c.; tank plates, 2.10c. for ¼-in. and thicker; No. 10 blue annealed sheets, 2.50c.; No. 28 black sheets, cold rolled, one pass, 2.80c.; No. 28 galvanized sheets, black sheet gage, 4.85c.

Old Material.—There has been a feverish advance in nearly all kinds and grades of scrap, and practically all the industries in the St. Louis industrial district have begun to buy, while the movement north and east, particularly for export purposes, continues. The lists reported last week were all closed at high figures, the dealers having evidently gone after supplies in active fashion. Rejections are not so frequent as has been the case in the past. Relaying rails are in good demand and continue quite hard to get, there being little disposition on the part of roads to let go of such material, particularly with new rails becoming difficult to get promptly. We quote dealers' prices, f.o.b. customers' works, St. Louis industrial district, as follows:

Per Gross Ton

Old iron rails	$14.00 to $14.50
Old steel rails, rerolling	14.25 to 14.75
Old steel rails, less than 3 ft	13.50 to 14.00
Relaying rails, standard section, subject to inspection	21.00 to 23.00
Old carwheels	12.50 to 13.00
No. 1 railroad heavy melting steel scrap	13.50 to 14.00
Heavy shoveling steel	11.50 to 12.00
Frogs, switches and guards cut apart	13.00 to 13.50
Bundled sheet scrap	8.50 to 9.00

Per Net Ton

Iron angle bars	$14.00 to $14.50
Steel angle bars	12.00 to 12.50
Iron car axles	17.00 to 17.50
Steel car axles	18.00 to 18.50
Wrought arch bars and transoms	16.00 to 16.50
No. 1 railroad wrought	12.50 to 13.00
No. 2 railroad wrought	12.00 to 12.50
Railroad springs	12.50 to 13.00
Steel couplers and knuckles	12.50 to 13.00
Locomotive tires, 42 in. and over, smooth inside	12.25 to 12.75
No. 1 dealers' forge	9.50 to 9.75
Mixed borings	7.50 to 8.00
No. 1 busheling	10.00 to 10.50
No. 1 boilers, cut to sheets and rings	8.00 to 8.50
No. 1 railroad cast scrap	10.75 to 11.25
Stove plate and light cast scrap	8.50 to 9.00
Railroad malleable	9.00 to 9.50
Agricultural malleable	8.00 to 8.50
Pipes and flues	8.00 to 8.50
Railroad sheet and tank scrap	7.75 to 8.25
Railroad grate bars	8.25 to 8.75
Machine shop turnings	8.00 to 8.50

The Lackawanna Iron & Steel Company blew in last week one of its Colebrook furnaces at Lebanon, Pa., which has been out of blast and under repair for a number of months.

New York

NEW YORK, Nov. 17, 1915.

Pig Iron.—There are some inquiries for early shipment, indicating that foundries are melting more pig iron than they expected to use. There are also occasional inquiries of larger size for delivery in the first quarter and the first half of 1916. The total purchases recently made by a Bridgeport, Conn., foundry were 3500 tons, or 1000 tons more than reported. An Elizabethport foundry has closed for 2500 tons of foundry iron, 1500 tons of higher silicon and 1000 tons of lower silicon, for delivery in the first half of 1916. There is still considerable Canadian inquiry for low phosphorus pig iron. Sales have been made at $30 at Schuylkill Valley furnace, while Lebanon iron has also brought as high as $30 at furnace. A sale of basic in east central Pennsylvania was put through at $18, delivered. Buffalo iron is more generally quoted at $16.50 at furnace for No. 2 X. One furnace in that district is out for relining and another will need to stop for repairs, having developed a hot spot. The tendency of prices is still upward. We quote Pennsylvania irons at tidewater as follows for fourth quarter delivery: No. 1 foundry, $17.75 to $18; No. 2 X, $17.25 to $17.75; No. 2 plain, $16.75 to $17. Buffalo No. 2 X at tidewater, $18.10 to $18.60. Southern iron at tidewater, $17.75 to $18.25 for No. 1 and $17.50 to $17.75 for No. 2 foundry and No. 2 soft.

Ferroalloys.—Receipts of British ferromanganese are reported to about equal those for the past two or three months which is 50 to 55 per cent of normal. Most of this is delivered on contracts, though sales of small lots are being made at $100, seaboard. The large inquiries reported last week have not resulted in sales. There are frequent inquiries for small lots, but no insistent demand. It is estimated that imports in October were about 4500 tons. Sales of domestic ferromanganese are noted at a little higher than $100, seaboard, but selling by home producers is not active. Ferrosilicon, 50 per cent, is in very strong demand and hard to get. One sale of 900 tons for 1916 delivery is noted. The quotation is about $85 to $87, Pittsburgh.

Finished Iron and Steel.—Some mills are practically out of the market so that their quotations of 1.60c., Pittsburgh, are nominal; others capable of supplying more or less odd lots are asking 1.70c., Pittsburgh; Eastern plate makers have advanced their prices $3 a ton or to 1.85c., Pittsburgh, and even one of these for such business as it has been considering for 1916 has asked 2c.; warehouse prices are up $2 more a ton since last week's report, although this represents not over $9 a ton between mill and store prices; plain structural material is, in view of these things, stronger and nothing below 1.60c., Pittsburgh, is heard of, so that this price marks the minimum with quotations $2 and $3 above this. Many are talking of the possibility of 2c. steel. So far new business for future shipments is not being considered. In spite of the advancing prices, fabricators are expecting that money will be cheap enough to encourage even some speculative building work. There is a steady movement of contracting of a variety as indicated in the subjoined list. Difficulty of domestic manufacturers in securing steel, even in the case of those which have projected contracts is noteworthy, 9000 tons of about 5½ in. steel, for example, being offered to steel makers for delivery beginning in December without takers. The condition is also described in the case of 8000 tons, mostly structural steel, it is understood, for first quarter which has been turned down, though the buyer expects to pay at least 1.75c., Pittsburgh. Deliveries of structural steel can be obtained in 4 to 10 weeks, with some possibility occasionally of certain sizes in less time. The movement in bar iron is maintained but apparently the 1.60c., Pittsburgh, price has been shaded in some cases. The structural lettings include: Hasco loft, Fourth Avenue and Twenty-eighth Street, 1100 tons, to Harris Silvers Baker Company; Prudential Insurance Company, 500 tons, to Hay Foundry & Iron Works; Baltimore & Ohio, 1200 tons, to the Mount Vernon Bridge Works, and New Jersey Zinc Company, 200 tons, to American Bridge Company. New subway work to be bid for in the next three weeks involves 30,000 tons of steel and 43,500 tons of cast-iron tunnel segments. To the railroad bridge work coming into the market may be added 800 tons for the Baltimore & Ohio and 200 tons for the Pennsylvania. The Winchester Repeating Arms Company is to build another structure, taking 300 tons. Other works includes 800 tons for the Imperial Oil Company, Toronto, 500 tons for the Atlantic Refining Company, and 500 tons for the Worth open-hearth plant, Coatesville. We quote as follows: Structural material from mill at 1.60c. to 1.70c., Pittsburgh, steel plates at 1.70c. to 1.85c., Pittsburgh, and steel bars at 1.70c., Pittsburgh. For delivery to New York a freight rate of 0.169c. per pound is to be added. For shipments out of warehouse, shapes and plates are 2.30c., New York, and steel and iron bars 2.25c.

Cast-Iron Pipe.—While municipal lettings have apparently ceased in this locality, as usual at this season, private buying continues brisk. Numerous gas and water companies are entering the market for spring delivery. This movement is occurring earlier than usual and the quantities involved are generally larger than heretofore. Manufacturers are receiving frequent inquiries from foreign sources, but business of this character is slow to develop. Prices are firmly held and appear likely to go higher. Carload lots of 6-in., Class B and heavier, are quoted at $26.50 per net ton, tidewater, Class A and gas pipe taking an extra of $1 per ton.

Old Material.—Although transactions have not increased to any considerable extent, the market shows an advancing tendency, which is partly attributed to larger business at a higher level of prices at Pittsburgh and other Western points. A better demand for wrought scrap is a feature of the local situation. Steel axles are still in good demand for export and prices are higher, carrying iron axles up with them. Brokers are paying about as follows to local dealers and producers, per gross ton, New York:

Old girder and T rails for melting	$12.50 to $12.75
Heavy melting steel scrap	12.50 to 12.75
Relaying rails	19.50 to 20.00
Rerolling rails	14.00 to 14.50
Iron car axles	24.00 to 25.00
Steel car axles	25.00 to 26.00
No. 1 railroad wrought	14.75 to 15.00
Wrought-iron track scrap	13.75 to 14.00
No. 1 yard wrought, long	13.50 to 13.75
No. 1 yard wrought, short	12.50 to 12.75
Light iron (nominal)	4.00 to 4.25
Cast borings	7.75 to 8.00
Wrought turnings	7.75 to 8.00
Wrought pipe	11.25 to 11.50

Cast scrap is in continued good demand. Dealers' quotations to consumers of cast scrap are as follows, per gross ton, New York:

Old carwheels	$12.00 to $12.50
No. 1 cast (machinery)	12.75 to 13.00
No. 2 cast (heavy)	11.75 to 12.00
Stove plate	10.00 to 10.25
Locomotive grate bars	9.25 to 9.75
Malleable cast (railroad)	10.00 to 10.50

British Market Still Higher

Semi-Finished Steel Quotations Withdrawn—Welsh Steel Position Adjusted

(By Cable)

LONDON, ENGLAND, Nov. 17, 1915.

The pig-iron market is strong and advancing on increased buying, high costs and labor shortage. Hematite iron is strong and scarce. It is impossible to quote semi-finished steel, as British works are withdrawing quotations. Finished steel is advancing, but merchant business is more and more limited and quotations are hardly obtainable because works are filled with government orders. Stocks of pig iron in Connal's stores were 130,396 tons at the close of last week, as compared with 130,097 tons one week previous.

The Welsh steel position has been practically adjusted by the decision that certain works will run

solely on shell steel and others solely on merchant material. More inquiry is reported for rails, but British works are not bidding on most overseas business. Tin plates are very strong with increased demand, especially for oil sizes, which command about 21s. A big business has been done at this figure with Japan also inquiring. Galvanized sheets are almost unquotable, but small sales are reported of 24 gage at 23s. We quote as follows:

Tin plates, coke 14 x 20, 112 sheets, 108 lb., f.o.b. Wales, 23s. 6d., against 20s. last week.

Cleveland pig-iron warrants, 69s. 2d., compared with 68s. 1½d. a week ago.

No. 3 Cleveland pig iron, maker's price, f.o.b. Middlesbrough, 69s. 6d., against 68s. 6d. a week ago.

Steel black sheets, No. 28, export, f.o.b. Liverpool, £14 5s., compared with £13 5s. last week.

Steel ship plates, Scotch, delivered local yards, £10 15s., against £10 10s. a week ago.

Steel rails, export, f.o.b. works port, £9 17s. 6d., against £8 17s. 6d. a week ago.

Hematite pig iron, f.o.b. Tees, 120s.

Sheet bars (Welsh), delivered at works in Swansea Valley, nominal.

Steel joists, 15 in., export, f.o.b. Hull or Grimsby, £12.

Steel bars, export, f.o.b. Clyde, £13 10s., compared with £12 15s. last week.

Ferromanganese, f.o.b., £20 15s.

Ferrosilicon, 50 per cent, c.i.f., £24 to £25.

(By Mail)

Enormous Needs in Shell Steel—Possible Benefit of Conscription—American Steel Scarce

LONDON, ENGLAND, Nov. 2, 1915.—Conditions continue to tighten up without intermission and now that the stocks of warrant iron have begun to steadily decrease prices have had a sharp advance. The general outlook is so linked up with war conditions that it is almost impossible to regard the situation from the merchant point of view. Business is severely restricted, and prices must undergo a further hardening owing to the enormous withdrawals of labor. Every week sees more and more works taken over for munitions which is bound to go on. The hematite iron makers are securing higher prices and are having difficulty in obtaining raw material. The workmen in South Wales are in a most unaccommodating mood and are raising all sorts of difficulties, even in discharging ore steamers at standard wages, having introduced a system of blackmail which owners are to fight to the uttermost.

Effects of the absence of conscription are being felt. Conscription draws the slackers and wasters as well as the good men, whereas by the voluntary system practically all the best men are with the colors, and a large proportion of those left behind are of the undesirable types, whose chief object is to produce as little as possible at the greatest cost. Hence ore boats, particularly in Wales, have been held up and steelworks, engaged on government contracts, inconvenienced. A sensation has been caused by the resignation of Mr. Stanton, the agent for the miners in the Aberdare district, who has stated that the pro-German section among the Welsh workmen has become intolerable. Some Welsh steelmakers seem to be following the action of the stevedores and the miners in their refusal not to work with non-unionists, and the munitions act is, by arrangement with the government, a dead letter in South Wales.

Semi-finished steel is exceedingly brisk and Welsh bars to-day stand at £8 10s. a ton upward, delivered to local works. Some business has been done, but most works decline to quote until they can see how matters are going to turn out in connection with the proposed government commandeering of the Welsh steel output for shell requirements. The national needs call for millions of tons of shell steel and negotiations are pending in Scotland for phenomenally large orders.

There seems to be a growing conviction that the next few months will see the back of the war broken and all efforts are being directed in this country to attain this. General merchant business in iron and steel is almost negligible, and the government has practically monopolized the mills, even those in the malleable iron trade. It is no wonder that the tendency should be strongly upward and there seems to be no relief in sight so far as America is concerned, for it is becoming more and more difficult to buy iron and steel in the United States or when bought to ship it.

Metal Market

NEW YORK, Nov. 17, 1915.

The Week's Prices

Cents Per Pound for Early Delivery

	Copper, New York		Tin,	Lead		Spelter	
		Electro-	New	New	St.	New	St.
Nov.	Lake	lytic	York	York	Louis	York	Louis
10	18.37½	18.25	37.00	5.15	5.05	16.00	15.75
11	18.37½	18.25	39.50	5.15	5.05	16.25	16.00
12	18.50	18.37½	43.50	5.15	5.05	16.50	16.25
13	18.62½	18.50	44.00	5.15	5.05	16.75	16.50
15	18.75	18.62½	44.50	5.25	5.15	17.25	17.00
16	19.00	18.87½	42.75	5.25	5.15	17.37½	17.12½

Copper is active and higher. Tin has advanced but shows a tendency to ease off. Lead has been advanced $2 per ton and a large export business is reported. Spelter continues to advance under heavy inquiry. Antimony is active and higher.

New York

Copper.—To a large extent in a quiet sort of way, a heavy business in electrolytic has been done in the past few days, as a result of which the quotation advanced to 19c., cash, New York, or 18.87½c., thirty days, delivered. While a good part of the business came from domestic war contractors, the producers have sold freely for export and could have done a much larger foreign business had it been possible to obtain the necessary freight room. The Lake companies are practically sold out for the next few months and on Monday of this week they virtually withdrew from the market by declining to quote. Outsiders have offered moderate quantities of Lake at 19c., cash, New York. Not all of the war requirements have been satisfied and the trade believes that 20c. copper is not at all improbable. Purely domestic demand is below normal, but shows some improvement. The exports of this month are light, amounting to only 9825 tons. The London market has shown great strength and is quoted at £92 per ton.

Tin.—The week has been one of excitement as a result of the report that Great Britain had closed, or would close, the Suez Canal. The price of spot metal went to near 45c. Neither confirmation nor denial of the rumor could be obtained until this week, when reports came from private sources that Great Britain had not closed the canal, after which prices receded from the high point and the quotation yesterday was 42.75c. The excitement was at its height last Thursday when 38c. to 41c. was asked for spot Straits, and 39c. for spot Banca. On that day anything that looked like tin was eagerly taken, and it is estimated that sales amounted to between 600 and 700 tons. The following day there was further activity, probably 400 tons changing hands, and 44c. was paid for spot. On Saturday, trading was lighter at 44c. for spot with November at 43.50c. Since the beginning of this week the scarcity of spot tin has become more acute, and there has been but little business, and in what there was wholesalers figured practically as retailers. The arrivals this month total 1090 tons, while there is afloat 4568 tons, most of which is not due until late this month.

Lead.—The American Smelting & Refining Company advanced its quotation $2 per ton on Monday, making the New York quotation 5.25c. and that at St. Louis, 5.15c. The market yesterday was strong at that level, not so much because of domestic buying as on account of large export sales which are quietly negotiated. It is reported that through J. P. Morgan & Co. 15,000 tons was purchased for export in 1916. Most of the producers would rather sell here than abroad, inasmuch as the price here is slightly higher than that in London. Were it not for the high and scarce ocean freights the export business would be of still greater proportions, but as it is, it is enough to support this market. The exports this month total 813 tons.

Spelter.—Since the beginning of this week inquiry has been heavy, especially from the galvanizers, and quotations have been carried up to 17.37½c. and 17.50c., New York. St. Louis is 25 points lower. The London market has been particularly strong, and there are indications that a corner has been effected there. It advanced £7 to £85 10s. Nov. 11, and the following day went to £87, bringing the per lb. equivalent of the London quotation close to 18c. A strong demand for galvanized sheets has caused the mills to actively seek spelter, which, coupled with the foreign situation and the war demand, has given the market its strength. For December deliveries 17c. is quoted, and for January 16.75c. The exports this month total 3495 tons.

Antimony.—Makers of war munitions have been active purchasers, and Chinese and Japanese grades have advanced to 37.50c. to 38c., duty paid. Spot metal is becoming more scarce.

Old Metals.—The market is strong. Dealers' selling prices have been advanced and are now as follows:

	Cents per lb.
Copper, heavy and crucible	17.00 to 17.50
Copper, heavy and wire	16.50 to 17.00
Copper, light and bottoms	15.00 to 15.50
Brass, heavy	12.00 to 12.25
Brass, light	10.25 to 10.50
Heavy machine composition	14.00 to 14.25
No. 1 yellow rod brass turnings	12.50 to 13.00
No. 1 red brass or composition turnings	12.00 to 13.00
Lead, heavy	4.75
Lead, tea	4.50
Zinc	11.00 to 12.00

Chicago

Nov. 15.—Metal prices moved sharply upward in the course of last week's market, advances being conspicuous with respect to copper, tin, lead and zinc. We quote: Casting copper, 18.50c.; Lake copper, 19c.; tin, carloads, 45.50c. to 46c.; small lots, 48c.; lead, 5.20c.; spelter, nominally, 17.50c.; sheet zinc, nominally, 17.50c.; Cookson's antimony, 50c.; other grades, 38c. to 39c. On old metals we quote buying prices for less than carload lots as follows: Copper wire, crucible shapes, 15.50c.; copper bottoms, 14.50c.; copper clips, 14.75c.; red brass, 13c.; yellow brass, 11c.; lead pipe, 4.50c.; zinc, 12c.; pewter, No. 1, 24c.; tinfoil, 31c.; block tin pipe, 33c.

St. Louis

Nov. 15.—Non-ferrous metals have all been firmer, with some rather sharp advances. Lead is quoted to-day at 5.40c.; spelter, 18c.; tin, 48c.; Lake copper, 19c.; electrolytic copper, 18.75c.; Asiatic antimony, 38c. In the Joplin ore district an increasing disposition was evident to hold ore for prices more on a parity with metal prices. The range for 60 per cent zinc blende was $85 to $110, the latter for the choicest ores. Calamine sold from $65 to $75. Lead ore was $60 to $64 for 80 per cent. The average for the week's production was blende, $96.47; calamine, $67.83, and galena, $59.63 per ton. Miscellaneous scrap metals are quoted as follows: Light brass, 6.50c.; heavy yellow brass, 8.50c.; heavy red brass and light copper, 10c.; heavy copper and copper wire, 12c.; zinc, 6.50c.; lead, 3.50c.; tea lead, 3.50c.; pewter, 20c.; tinfoil, 26c.

Antimony mining in Japan was neglected before the war because imported Chinese sulphide of antimony was cheap, selling at 2.62c. per pound, while it is now quoted at 15.725c. per pound. Japanese mining of antimony has been extended recently, the output aggregating 50 tons per month, though the consumption of the country is put at 450 to 500 tons per month.

The Orillia Molybdenum Company, Orillia, Ontario, Canada, has made its first shipment of two tons of concentrates of molybdenum to the British War Office. This is the first time that such ore has been treated in Canada. The company has received instructions from the War Office to make weekly shipments.

The world's output of new platinum in 1914 is placed at 263,453 troy ounces by James M. Hill in a bulletin of the U. S. Geological Survey, "The Production of Platinum and Allied Metals in 1914." Russia furnished 241,200 ounces, Colombia 17,500 ounces and the United States 570 ounces.

Iron and Industrial Stocks

NEW YORK, Nov. 17, 1915.

Aside from occasional sinking spells, in which the highly speculative stocks led in a sharp decline, the past week has shown a general tendency toward higher levels. Rumors of approaching peace, attacks of Austrian or German submarines on passenger steamships carrying Americans and irritation at incendiary fires in works making war material have only been effective temporarily in depressing prices. The sensational gain in unfilled orders reported by the Steel Corporation had a distinctly stimulating influence on the whole market. Some industrial stocks which had made severe declines in the previous week more than recovered their losses in the interval since our last report. The range of prices on active iron and industrial stocks from Wednesday of last week to Tuesday of this week was as follows:

Allis-Chal., com.	27	- 35⅞	Rumely Co., pref.	7⅝	- 7¾
Allis-Chal., pref.	72¾	- 74⅞	Sloss, com.	55¾	- 59
Am. Can, com.	56¾	- 63⅞	Sloss, pref.	92	- 94½
Am. Can, pref.	105⅜	-108	Pipe, com.	26	- 28½
Am. Car & Fdy., com.	76¾	- 84	Pipe, pref.	53	- 54½
Am. Car & Fdy., pref.	117¼	-117¼	U. S. Steel, com.	83¾	- 88⅝
Am. Loco., com.	58½	- 71⅞	U. S. Steel, pref.	115⅝	-116¾
Am. Loco., pref.	98½	- 99⅝	Va. I. C. & Coke.	60	- 65½
Am. Steel Fdries.	57	- 64¾	West. Electric.	66¾	- 70¼
Bald. Loco., com.	105½	-125	Am. Radiator, com.		360
Bald. Loco., pref.	109	-110	Am. Radiator, pref.		134
Beth. Steel, com.	400	-459⅞	Am. Ship, com.	34½	- 36½
Beth. Steel, pref.	160½	-162½	Am. Ship, pref.	78	- 79¾
Case (J. I.), pref.	88½	- 90¼	Chic. Pneu. Tool.	75½	- 83
Colorado Fuel	48⅜	- 56⅝	Cambria Steel	62¾	- 70¼
General Electric.	174¼	-178¾	Lake Sup. Corp.	9¼	- 10⅜
Gt. No. Ore Cert.	46⅜	- 51⅞	Pa. Steel, com.		50
Int. Harv. of N. J., com.	107	-110¼	Pa. Steel, pref.	79	- 84½
Int. Harv. Corp., com.		70	Warwick	10¼	- 10¾
Lackawanna Stl.	67	- 83	Cruc. Steel, com.	67	- 78⅛
N. Y. Air Brake.	128	-145	Cruc. Steel, pref.	103	-108
Nat. En. & Stm., com.	26	- 32	Harb-Walk., Refrac., pref.	98½	- 99
Nat. En. & Stm., pref.	92	- 93⅜	La Belle Iron, com.	52½	- 55½
Pitts. Steel, pref.	97½	- 99	Am. Brit. Mfg., com.	33	- 37
Pressed Stl., com.	60½	- 69	Can. Car & Fdy., com.	90	-102
Pressed Stl., pref.	103¾	-104⅛	Can. Car & Fdy., pref.	109	-116
Ry. Steel Spring, com.	42¾	- 47⅝	Carbon Stl., com.	85	- 93
Ry. Steel Spring, pref.	99¼	- 99⅝	Carbon Stl., 2d pref.		70
Republic, com.	47	- 53¼	Central Fdy., com.	15½	- 16
Republic, pref.	105	-107⅜	Dom. Steel, com.	49	- 50½
Rumely Co., com.	2¾	- 4	Driggs-Seabury	138	-151¼
			Midvale Steel	76	- 85

Dividends

The Harbison-Walker Refractories Company, quarterly, 1 per cent on the common stock, payable Dec. 1. This is an increase of ½ of 1 per cent and places the stock on a 4 per cent annual basis.

The Willys-Overland Company, regular quarterly, 1¾ per cent on the preferred stock, payable Jan. 1.

The Maxwell Motor Company, quarterly, 1¾ per cent on the first preferred stock, payable Jan. 3.

The Underwood Typewriter Company, regular quarterly, 1 per cent on the common stock, and 1¾ per cent on the preferred stock, payable Jan. 1.

A new method of making ferroalloy and other additions to steel is covered by a patent (U. S. 1,156,051—Oct. 12, 1915) granted to Jegor I. Bronn of Rombach, Germany, one half being assigned to the Rombacher Hüttenwerke of that city. The additions are made to refined molten iron in a separate subsidiary bath and then this separate bath added to the main bath of steel or iron in the casting ladle. It is claimed that this gives an exact method, insuring less loss than in adding directly to the main bath. It is suggested that a means is also provided for making carbon steels almost free from manganese or manganese steels low in carbon. More thorough diffusion is also claimed.

The number of women employed in Germany increased from Jan. 1 to July 1, 1915, by 500,000 and up to April 30, this year, 958,247 members of German trade unions, or 41.7 per cent of their total effective membership, had been called to the colors. The iron and steel and metal works have contributed 260,000 of these labor union recruits, or 50 per cent of their strength.

More Millions to Be Spent at Gary

The pressure upon all its steel works has led the United States Steel Corporation to shape up rapidly its plans for additions at important producing centers. In the past week announcement was made that additional improvements at Gary, Ind., would be started at once, consisting of two blast furnaces, a number of open-hearth furnaces, blooming mill and Bessemer converters, the whole amounting to $7,500,000. It is known that the plans considered for Gary additions in the early part of 1913 involved four blast furnaces and it is quite certain that later two will be added to the two now announced. The new duplexing plant will be built on the site reserved for the No. 2 open-hearth plant in the original Gary plans. The Nos. 3 and 4 open-hearth buildings, each containing fourteen furnaces, were put up first; later the No. 1 plant was erected. At present there are forty-three open-hearth furnaces. The original layout provided for twelve blast furnaces and the construction now contemplated will fill out that number.

The expenditures of the Steel Corporation in the Chicago district as now outlined will be nearly double $7,500,000, as the duplexing plant at South Works represents over $2,000,000 and the construction planned at Gary by the American Sheet & Tin Plate Company is estimated above $3,000,000.

The latest statement concerning the Minnesota Steel Company plant at Duluth is that pig iron will probably be made by Dec. 1 and steel by Dec. 15.

Steel Foundry Activity at Chester, Pa.

The steel foundries of Chester, Pa., district are now operating at nearly full capacity. Five large open-hearth plants and one converter foundry are busy with locomotive, ship and general jobbing work, with prospects for continued prosperity for months to come. Some of the plants have order books filled for two or three months in advance. Prices show a decided tendency upward and the conditions are rapidly approaching those which constitute a sellers' market where the foundrymen can select their orders. Quotations are at least 50 per cent higher than they were early in the year.

The Penn Steel Castings & Machine Company has recently added an 8-ton open-hearth furnace to its No. 2 foundry, which has a 5-ton furnace in operation. This company's No. 1 foundry has three 30-ton open-hearth furnaces. The 5- and 8-ton open-hearth furnaces in the smaller foundry replace a converter equipment installed some years ago.

The Chester Steel Casting Company is not yet operating its large open-hearth furnaces. The Mahaffy steel department is reported very busy and the company is operating a 1½-ton open-hearth furnace.

The Atlantic Steel Casting Company

The Atlantic Steel Casting Company's rebuilt foundry at Chester, Pa., on the property formerly owned by the Keystone Steel Casting Company, is attracting some attention. The crucible and small open-hearth equipment of the old company has been dismantled and an addition made to the building, in which a modern oil-burning 4-ton open-hearth furnace has been erected with some novel features and particularly designed for operating at high temperatures. The foundry is practically new in its equipment, among which, besides the furnace, is an Ingersoll-Rand 1300-cu. ft. air compressor, a sand mill, a 10-ton Niles crane, two molding machines and entire new flask equipment. The method of handling the sand and serving the bench molders is novel. As far as possible all castings will be machine molded, consisting of small jobbing and other work. The output is estimated at 300 tons a month. The first heat is expected to be tapped on Nov. 18. The company starts out with its output sold for three months to come. Dudley Shoemaker, formerly works manager of the Indiana Harbor plant of the American Steel Foundries, is vice-president and general manager, and will have direct supervision of the output. A. R. Brunker, of Chicago, is president; C. Tolan, Jr., vice-president; R. J. Brunker, secretary and treasurer, and D. W. Call, chairman. State Senator W. C. Spoul, of Chester, is a director, together with Theodore E. Brown, of Philadelphia, and the officers. A. R. Brunker & Co., 1001 Crozier Building, Philadelphia, will handle the sales.

Railroad Car Business

The largest railroad car inquiry before the car-builders at the moment is for 10,500 freight cars and 175 passenger cars for the Pennsylvania Railroad, though it is expected that at least 20,000 cars will be bought. At this writing early settlement is expected on 2000 cars for the Delaware, Lackawanna & Western, which is also asking for 10 express cars. For passenger equipment the Interborough Rapid Transit Company is asking for 311 cars and the Burlington for 54 passenger cars. The Virginian has entered the market for 250 box cars, and the Kansas City Southern for 200 gondolas.

The purchases since the last report include the following: For the Central Railroad of New Jersey, 1000 hopper cars to the Pressed Steel Car Company, 1000 hopper cars to the American Car & Foundry Company and 1250 box cars to the Standard Steel Car Company; for the Western Pacific, 1000 box cars awarded to the Pullman Company; 1000 center constructions for the Northern Pacific, placed with the Pressed Steel Car Company, which has also taken repairs for 600 cars from the New York, Chicago & St. Louis. The New York Central has placed 500 cars with the Haskell & Barker Car Company and 500 cars with the American Car & Foundry Company, originally so awarded, later cut off and finally again added to the original allotment. The Haskell & Barker Car Company is to build 400 flat cars for the Santa Fé. The Cincinnati, Hamilton & Dayton has closed for 850 cars.

The Remington Arms-Union Metallic Cartridge interests are making extensive purchases of land and engaging in important home building operations in Bridgeport, Conn. Houses for fifty-two families are now ready for occupancy, and about Dec. 1 182 families more will be provided for. All the houses now built or under construction are of brick and designed to have æsthetic as well as practical value. Work will be started at once on more buildings, and those now ready or under way will house 780 families. There is also under construction a model dormitory for girls which will consist of thirteen units of about twenty-five rooms each.

The International Oxygen Company is erecting an oxygen and hydrogen generating plant at Verona, Pa., for the accommodation of its customers in the Pittsburgh district, giving them better deliveries than were possible from its plant at Newark, N. J. It will also serve as a demonstrating installation of the company's system for inspection by the rapidly increasing number of heads of industries who are deciding to secure the economies resulting from the production, in their own shops, of their required oxygen and hydrogen. Philip J. Kroll will be manager of this branch.

The Chattanooga Iron & Coal Company, C. E. Buek, president, and H. R. Lacey, manager, is preparing to blow in its furnace at Chattanooga, Tenn., about Dec. 1. At the Estelle iron ore property in Walker County, which the company acquired three years ago, mining operations have been started up after an idleness of two years.

The Wallis Tractor Company, formerly at Cleveland, Ohio, has completed the removal of its works, offices and operatives to Racine, Wis., occupying a large part of the former Racine-Sattley carriage plant. It manufactures the Cub tractor for farm work and general utility. The official personnel is kept intact.

Pittsburgh and Nearby Districts

Official denial is made of the report that the Jones & Laughlin Steel Company is interested in a proposed merger, to be known as the Keystone Steel Company, to include the Pennsylvania, Cambria and other companies. The company will not be included in any other of the proposed steel mergers about which so much is being printed in the daily press.

The Standard Plate Glass Company, Butler, Pa., is building an addition to its grinding and polishing shed, 158 x 200 ft., of brick and steel. It will be equipped with electric cranes, motors and the latest glass-working appliances.

As a result of the advance in prices of bar iron in September and October, wages of puddlers in rolling mills that sign the Amalgamated Association scale will advance 10c. for November and December, or to $5.90 per ton.

The plant of the Chicago Pneumatic Tool Company, at Franklin, Pa., is reported to have received a large order for shells for Russia, placed through the Bethlehem Steel Company. At present the plant is working on an order for 300,000 3.3-in. shells for Great Britain.

Traffic managers of steel companies of western Pennsylvania appeared before the Interstate Commerce Commisson at Washington, D. C., Nov. 12, to support the proposed rate of 55c. per ton on iron and steel products from Pittsburgh to Pacific coast terminals.

The Youngstown Sheet & Tube Company, Youngstown, Ohio, has placed an order with the Pittsburgh Bridge & Iron Works, Pittsburgh, for about 300 tons of structural shapes for machine, boiler and other shops at its new Koppers by-product coke plant.

John L. Orrell, on Nov. 10, was appointed receiver of the Union Foundry & Machine Company, operating a foundry and machine shop on West Carson Street, Pittsburgh. He has been connected with the company for some years as superintendent. The receivership is not expected to continue indefinitely.

The Electric Steel Company, Latrobe, Pa., has recently added three electric furnaces to its equipment, one 1000-lb., one 3-ton and one 6-ton capacity. It is also installing one 12-in. and one 14-in. finishing mill and a large Mesta Machine Company hydraulic forging press. All this equipment is to be motor driven, and is expected to be completed and in operation by the end of the year.

The Wheeling Motor Car Company, Wheeling, W. Va., expects to build a factory for building motor cars. Inquiries should be addressed to G. M. Ford, care of the company.

The Brier Hill Steel Company, Youngstown, Ohio, has placed a contract with the Morgan Engineering Company, Alliance, Ohio, for two 25-ton and one 10-ton cranes.

Carnegie Day at the Carnegie Institute of Technology, Pittsburgh, will be celebrated Nov. 23 and 24 in commemoration of the eightieth birthday of Andrew Carnegie and the fifteenth anniversary of the foundation of the Institute.

The Public Service Commission of Pennsylvania has granted permission for a re-argument on the industrial railroad cases of interest to Pennsylvania steel companies. Argument will be heard at Harrisburg, on Dec. 7.

The New Castle Rubber Company, New Castle, Pa., will increase its capital stock from $500,000 to $1,000,000. It started to manufacture automobile tires a few months ago and is having such a heavy demand for its product that it has decided to practically double the capacity.

The new 32-in. blooming mill at the Edgar Thomson steel works of the Carnegie Steel Company has been turned over and found to work very satisfactorily. This mill will serve as a roughing mill for the new big rail mill, but it will not be put in steady operation until a new bloom shear, being built by the William Tod Company, Youngstown, has been installed. The No. 1 rail mill at Edgar Thomson is making standard section rails, No. 2 is making large steel rounds and No. 3, which is motor driven, is kept steadily on light rails, the demand for which is very active. No. 3 mill can roll about 15,000 tons of light rails per month.

The Phillips Sheet & Tin Plate Company, Weirton, W. Va., manufacturer of tin plate and cold-rolled strip steel, will make large additions to its cold-rolled department, including hot mills and other equipment. The company is just completing four hot tin mills at Weirton, making a total of 24 in this plant. It has 12 hot mills at its plant at Clarksburg, W. Va., and 12 at its plant at Steubenville, Ohio, making 48 in all. The four hot mills at Weirton will be ready about Jan. 1.

Standard Chain Company's Improvements

The Standard Chain Company, Pittsburgh, has recently built a large addition to its chain works at York, Pa. The new building is 230 x 240 ft., with an auxiliary 60 x 420 ft. The company has been crowded very much for room at the plant and the additions will furnish better accommodations for the employees. One large room is provided with tables and benches at which employees will eat their lunch, the company furnishing hot coffee free, both for the noon and midnight meals. On the second floor of the building is a well-lighted reading room provided with trade journals and other periodicals. Ample toilet facilities are distributed throughout the plant, including sanitary terra cotta wash stands with hot and cold water. In a special room are materials for first aid to the injured, under the supervision of the safety first committee.

A very complete office building has recently been erected, equipped with all modern conveniences. On vacant property near the plant a baseball diamond and tennis courts are being laid out, to be ready for use next season. John C. Schmidt, York, Pa., is president of the company, and these new additions to the plant and conveniences for the employees were built largely under his supervision.

The Newport News Shipbuilding & Dry Dock Company, Newport News, Va., has contracts for sixteen large vessels, none of which is less than 375 ft. long. This is the largest number in the history of the company. All are American merchant ships except the battleships Pennsylvania and Mississippi. The former is already launched. The company is considering the building of an extensive dispensary and hospital for the benefit of its 6000 employees.

The Peden Iron & Steel Company, Houston and San Antonio, Texas, on Nov. 12 celebrated its twenty-fifth anniversary. In a circular announcing this fact the company says: "Rounding out our first quarter of a century, we pause long enough to express our appreciation and gratitude to our friends for their loyalty and generous support which, by straightforward, honest business methods and the best of service, we hope to ever retain."

The Great Lakes Engineering Works, Detroit, Mich., has taken a contract for another freight boat for the Atlantic coast trade for 1916 delivery. The Toledo Shipbuilding Company, Toledo, Ohio, has been given a contract for a 600-ft. ore boat by the Great Lakes Steamship Company.

The United Smelting & Aluminum Company, New Haven, Conn., manufacturer of aluminum ingots and alloys, has opened an office at 830 Penobscot Building, Detroit, Mich., to take care of greatly increased business in that section.

The Chester Shipbuilding Company, Chester, Pa., has two vessels on which it is about to start at the old Roach shipyard, and can construct four more.

PERSONAL

R. G. Williams has been elected chairman of the committee for accident prevention and workmen's compensation of the National Association of Manufacturers. He is a member of the American Society of Mechanical Engineers, chairman of the safety committee of grinding wheel manufacturers, which committee drafted the "Safety Code for Use and Care of Abrasive Wheels," and a member of the standardization committee of grinding wheel manufacturers. He is associated with the Norton Company, Worcester, Mass., as sales engineer. On graduation from Columbia University he entered the employ of the Norton Company as a chemist in the analytical laboratory and was soon placed in charge of the mechanical division of the department of tests, later becoming assistant research engineer and safety engineer. He has delivered numerous lectures on accident prevention before safety societies, commercial organizations and technical trade schools.

R. G. WILLIAMS

Frederick H. Poor, who since the incorporation in December, 1909, of the S. K. F. Ball Bearing Company of New York has been its general manager, recently severed his connection with that organization, and has opened an office of his own at 30 Church Street, New York. Heretofore the company's product has been entirely imported from Sweden, but, as previously announced, a new organization, the S. K. F. Ball Bearing Company, of Connecticut, has been incorporated to manufacture S. K. F. ball bearings at Hartford, Conn. It is planned that the New York corporation will be absorbed by the new company after the first of the coming year, and with the introduction of American capital and consequent modification of the organization, Mr. Poor's contract with the original company has been purchased.

Frank A. Vanderlip, president National City Bank, New York City, has been made a director of the S. K. F. Ball Bearing Company, Hartford, Conn.

Alexander W. Behr, vice-president of the Russian-American Chamber of Commerce, Moscow, is now in this country in the interest of closer trade relations between Russia and the United States. His address is the Plaza, New York.

C. A. Buck, vice-president Bethlehem Steel Company, South Bethlehem, Pa., returned recently from Chile, where he has spent some months in the supervision of the new construction in connection with the company's Tofo iron mines.

What was termed a farewell surprise party was tendered on Nov. 13 to H. D. Williams by the citizens and employees of the Duquesne steel works of the Carnegie Steel Company at Duquesne, Pa. Mr. Williams was general superintendent of the works for some years, and was recently appointed president of the Carnegie Steel Company, to succeed A. C. Dinkey, resigned. There was a parade of about 2000 school children and 5000 citizens to the Williams home in Duquesne. Mr. Williams was presented with a very handsome bronze statue and Mrs. Williams was also suitably remembered.

C. H. Williams, formerly assistant superintendent at the Shoenberger works of the American Steel & Wire Company, Pittsburgh, has been appointed assistant superintendent of the Donora steel works of the company at Donora, Pa., of which J. B. Clark is general superintendent. William Pickford, formerly assistant superintendent of the Bessemer and blooming mills of the Shoenberger works, has been appointed assistant superintendent of the entire plant.

P. J. McArdle, a former president of the Amalgamated Association at Pittsburgh, has been elected a member of the Council of that city. John Williams, now president of the Amalgamated Association, was also a candidate for Council, but was defeated.

Dr. John A. Brashear, president American Society of Mechanical Engineers, has been appointed a delegate to the Pan-American Scientific Congress, which will meet in Washington, D. C., Dec. 27 to Jan. 7.

W. E. Moore, formerly general manager of the West Penn Traction Company, Pittsburgh, has resigned, and has opened offices in the Union Bank Building in that city, as a consulting engineer, making a specialty of building and equipping power plants.

R. J. Kaylor has been appointed publicity manager for the Youngstown Sheet & Tube Company, Youngstown, Ohio, a recently created office.

Eduardo Carrasco, appointed by the government of Chile to study commercial conditions in the United States, has come to the East after a stay in San Francisco. He will remain in New York for two or three months, making his headquarters at the United Export Bureau, 243 West Thirty-ninth Street, and will be pleased to attend to any inquiry or give any information desired about business conditions in Chile.

Oscar F. Lackey, until recently harbor engineer of Baltimore, Md., has taken charge of the small shell department of the Poole Engineering & Machine Company, Woodberry, Md.

W. W. Leck, superintendent of the merchant mill department of the Pennsylvania Steel Company's plant at Steelton, Pa., has been made superintendent of all the Steelton rolling mills.

Norman J. Gould, president Goulds Mfg. Company, Seneca Falls, N. Y., has been elected to Congress, filling the seat left vacant by the death of Sereno E. Payne, Auburn, N. Y.

George Puchta, the Republican candidate for mayor of Cincinnati, Ohio, who was elected by a majority larger than that given any previous candidate in the history of that city, is president of the Queen City Supply Company and a member of the Cincinnati Business Men's Club, Queen City Club and other social and business organizations.

George McG. Morris, president and treasurer of the J. B. Morris Foundry Company and of the Morris Machine Tool Company, Cincinnati, Ohio, has been elected president of the Cincinnati Business Men's Club.

W. H. Walker, director research laboratory of applied chemistry, Massachusetts Institute of Technology, Boston, will speak on "Chemical Research in the Iron and Steel Industry" on the evening of Nov. 19, at Rumford Hall, 50 East Forty-first Street, New York, before the Society of Chemical Industry, New York section.

Major Walter C. Penfield, works manager of the Remington Arms & Ammunition Company, Bridgeport, Conn., formerly manager of the Frankfort Arsenal, Philadelphia, has been appointed general manager of both the Remington Arms and the Union Metallic Cartridge plants at Bridgeport. He will be succeeded at the Remington plant by Capt. C. C. Shepard, formerly at the Springfield Arsenal. Major W. P. Phillips will continue as works manager of the Union Metallic Cartridge Company.

H. A. Fabian has resigned as purchasing agent of the New York, New Haven & Hartford Railroad and will be succeeded by George G. Yeomans.

R. W. Johnston has been appointed general superintendent of the new Donora zinc works of the American Steel & Wire Company at Donora, Pa. This plant is now in partial operation making zinc, and is expected to be fully completed about Jan. 1.

Thornton W. Price, formerly designing engineer with the American Bridge Company and for the past two years in charge of a large part of the work on the Panama Canal coaling stations, has opened offices in

the Woolworth Building, New York City, for the practice of structural and mechanical engineering.

The Westinghouse Electric & Mfg. Company, East Pittsburgh, Pa., has made changes in its supply department as follows: S. A. Chase, formerly special representative; T. J. Pace, formerly in charge of illuminating and rectifier divisions, and Carl G. Schluederberg, formerly head of switchboard sales, have been appointed assistants to Manager J. J. Gibson. C. E. Stephens, engineer of lighting, has been appointed manager of the illuminating section; C. Streamer, formerly head of the order division, has been made manager of the switchboard section, and A. P. Joseph, head of the order section. M. C. Morrow, formerly of the Philadelphia office, is appointed manager of the appliance section, a combination of the former heating, fan motor and ozonizer divisions. M. C. Rypinski, formerly manager of the D. & S. division of the New York office, becomes manager of the meter section. The power department, E. H. Sniffin, manager, announces the following section managers: W. H. Garrett, contracts; N. G. Worker, stokers, and H. D. Storer, auxiliaries.

J. D. Mooney has been appointed sales manager of the commercial department of the Hyatt Roller Bearing Company, Newark, N. J. For some years he has been in charge of belting sales for the B. F. Goodrich Company, Akron, Ohio.

James Newton Gunn, of Gunn, Richards & Co., New York, for some time general manager of the Studebaker Corporation, has been elected president of the United States Tire Company and also has been appointed assistant to the president of the United States Rubber Company, of which the tire company is a subsidiary.

Thomas Tesseman has been made general manager of the car plant of the Youngstown Car Mfg. Company, Youngstown, Ohio.

Ralph S. Edmondson has been elected vice-president of the American Abrasive Metals Company, 50 Church Street, New York, succeeding A. D. Morris, and will be foundry superintendent.

Joseph G. Butler, Jr., Youngstown, Ohio, has been made a member of the advisory board of the American Society, a federation for national unity organized at New York City, to foster patriotism and loyalty to American ideals.

Changes have been made in the executive organization of the J. I. Case Threshing Machine Company, Racine, Wis., and the present officers of this company are as follows: Frank K. Bull, president; E. J. Gittins, vice-president (in charge of sales); M. H. Pettit, vice-president (in charge of plants and production); Warren J. Davis, treasurer; William F. Sawyer, secretary; C. J. Farney, assistant treasurer; R. P. Howell, assistant treasurer; Stephen Bull, assistant secretary. In the election of Mr. Gittins and Mr. Pettit as vice-presidents the company announces the promotion of two men who have for years been identified with it.

Pittsburgh Foundrymen's Association

The monthly meeting of the Pittsburgh Foundrymen's Association was held in the Fort Pitt Hotel, Pittsburgh, the evening of Nov. 15, preceded by a dinner. A paper entitled "Efficiency and Common Sense" was read by C. B. Auel, director of standards, processes and materials of the Westinghouse Electric & Mfg. Company. Considerable discussion followed on the best method of figuring costs, this being really a discussion of the report presented by the cost committee of the American Foundrymen's Association at its recent meeting in Atlantic City and printed on pages 1118-1121 of THE IRON AGE of Nov. 11. It was decided to devote one meeting of the Pittsburgh Foundrymen's Association to the consideration of this important subject, and the members have been asked to prepare data on methods of keeping costs to be presented at this meeting, which will be held early in the coming year. R. W. Lust, American Steel Foundries, and John J. Jackson, R. D. Nuttall Company, both of Pittsburgh, were elected members.

OBITUARY

DANIEL O. ROGERS, for many years vice-president Skinner Chuck Company, New Britain, Conn., father of Paul K. Rogers, secretary and treasurer of the same company, died Nov. 12 at his home in New Britain, of heart disease, aged 61 years. He was born in South Cornwall, Conn., and was early associated with his father in the firm of D. M. Rogers & Co., which afterward became the Rogers Sash & Door Company. Of this company Mr. Rogers was president at the time of his death.

JOSEPH G. HENDRICKSON died at his home in Philadelphia, Nov. 4, after a short illness, aged 69 years. He was the founder of the Ajax Metal Company, which was established in 1880. He retired as president of the company a little over a year ago, and since then has been chairman of the board, also chairman of the board of the Ajax Metal Company of the South, Birmingham, Ala., and president of the Ajax Lead Coating Company. He was a member of the Union League of Philadelphia.

WILLIAM BARKER, president William Barker & Co., lathe makers, Covington, Ky., died at his home at Fort Thomas, Ky., Nov. 9, aged 63 years. He was one of the pioneer machine-tool builders in the Middle West. Up to three years ago his plant was located across the Ohio River in Cincinnati. He leaves three daughters and five sons. Three of the latter, Harold, Robert and William Barker, will have active charge of the firm's business.

HENRY V. MOORE, a well-known foundryman in the Central West, died at his home in Hamilton, Ohio, Nov. 8, aged 74 years. He was a native of Scotland, coming to this country at an early age. He was at one time superintendent of the F. & L. Kahn Company's foundry and afterward president of the former Vestor Foundry Company. He leaves five children.

FREDERICK A. KAMPFE, a former New York manufacturer, died Nov. 9 at his residence in Washington, D. C. He was one of three brothers, Richard, Otto and Frederick, who composed the firm of Kampfe Brothers, known throughout the world as the inventors and manufacturers of the first safety razor.

HENRY B. DARLINGTON, secretary and treasurer of the Standard Steel Spring Company, Coraopolis, Pa., committed suicide by shooting himself at his home in Pittsburgh, Nov. 14. He was only 31 years old, but had been in ill health for several months, suffering from nervous troubles.

FREDERICK SATTLER, president Belleville Stove & Range Company, Belleville, Ill., died Nov. 5 from apoplexy, aged 63 years. He was born in Germany and had been a resident of Belleville for many years. He leaves his widow and four sons and daughters.

WILLIAM C. JOHNSTON, at one time manager of the Sligo Iron & Steel Company, later the Carter Iron Company, Pittsburgh, died recently at his home in that city. He was born in England, and came to this country in 1869, when a boy.

CHARLES C. SCAIFE, Jr., secretary William B. Scaife & Sons Company, Pittsburgh, died Nov. 13, aged 41 years. He was born in Allegheny and was graduated from Cornell University in 1896.

Germany's Pig-Iron Output for September

Germany's pig-iron output for September, according to the report of the Association of German Iron and Steel Masters in *Stahl und Eisen*, was 1,033,078 metric tons, as compared with 1,050,610 tons in August—34,435 tons a day as against 33,890 tons. The output in September, 1914, was 580,087 tons and in September, 1913, it was 1,590,849 tons. The production for the first nine months was 8,665,528 tons against 12,016,888 tons to October 1, 1914.

Fire in the Roebling Wire Rope Plant

A disastrous fire occurred at the works of John A. Roebling's Sons Company early on the morning of Nov. 11, destroying the so-called Elmer Street rope shop, which constituted about one-third of the productive wire rope capacity of the works. About 1000 men were given employment in this department. The Buckthorn works of the company destroyed by fire last January have been rebuilt and are complete excepting power, which will be in service in six weeks. They are very extensive and will take care of the present loss in buildings as soon as machinery can be built. The larger part of the rope works is intact, and by extra work will be able to take care of much that was done in the burned department. That part of the works devoted to the production of steel, steel wire, cold rolled strips, telegraph wire, etc., is not affected, though exaggerated reports of the fire were spread broadcast.

Concerning its operations the company adds: The John A. Roebling's Sons Company does not make munitions of war or anything appertaining to them; it has been for a long time making steel for the Midvale works, which is to be used for car wheels. In addition some 1½-in. rounds have been furnished which are suitable for a thousand purposes, and if used for rifles the company is not responsible. Other products are those used commercially every day, and if used for war purposes they can only be used for the saving of life and not for its destruction. No plans for reconstruction have been made; a part of the destroyed buildings will be erected again, but the larger portion will go elsewhere. The origin of the fires has not been explained and they may be incendiary, but the company has no knowledge to sustain such belief.

New England Labor Conditions

For the first time in many weeks, no new strike of any real importance has been reported in the New England metal trades in the past week. The machine shops are slowly but surely reaching a solution of their difficulties. In Hartford the manufacturers are confident that the gains being made in their working forces will continue and that before many weeks they can report full working forces. While organization work is being actively carried on by the unions among the shops which have not thus far been affected there is little indication that other outbreaks will take place in the immediate future.

At Worcester, Mass., the condition is little changed, but the employers all report that their old employees are slowly coming back to work. However, there has been no marked change in the situation, which remains the most serious among the metal-working centers.

At Meriden, Conn., an attempt to bring in a company of strike-breakers to replace the silverworkers who are now out resulted in a serious conflict at the factory gates, in which revolvers, stones and clubs were freely used. No one was seriously injured and sixteen of the strikers were arrested.

It is reported that sixty employees of the Bridgeport Engineering Company walked out Nov. 12, when demands for an 8-hr. day were refused.

The industrial situation in the other metal-working cities of New England grows better day by day. While many of the strikers in the larger centers have sought and found work elsewhere, manufacturers are reporting that they are assured by many of these men that they intend to return to their old employers as soon as conditions will permit.

If a workman is injured and it is found that he violated a rule which he was unable to read, as he was a foreigner, and no other effort was made to enforce the rule than to post the notice, he may secure compensation, according to an opinion handed down by the Maryland State Industrial Accident Commission.

The Landis Tool Company, manufacturer of grinding machines, Waynesboro, Pa., has granted its employees an increase of 1c. an hour in wages. The increase went into effect Nov. 1.

The Eight-Hour Day in Machine Shops

A recent comment by President H. H. Rice of the National Metal Trades Association, on the machine shop strike situation notes that 723 strikers had returned to work in Cincinnati shops up to Nov. 10, so that 2708 men were at work in struck shops, or as many as were out.

A bulletin of the national association, issued under date of Nov. 5, calls attention to the improvement in the situation both in Cincinnati and Worcester, where the members stood for the open shop and opposed the eight-hour day. The success of the opposition to the Cleveland demands is made much of, the strike having been declared off in five important shops which it was attempted to tie up, as already noted in these columns. Efforts have been made by union officers to give the impression that the eight-hour movement was succeeding rapidly, but the fact is that in far the greater number of strikes where concessions have been made these have been in increased wages or in the granting of somewhat shorter hours, though generally more than forty-eight per week. President Rice states that not 1 per cent of the machine shops of the country are working on an eight-hour basis.

Swedish Iron Ore for Germany

Commenting on the recent activities of British submarines in the Baltic Sea in sinking twenty-two German vessels, laden with Swedish iron ore, copper and various metals, a partial list being given, the London *Ironmonger* says:

Insurance companies, which two or three weeks ago were quite willing to undertake the risk on boats and cargo between Swedish and German Baltic ports at about 10s. per cent, by the end of last week had raised their rates to £5, and even higher figures are now reported to have been paid. It is also stated that more than 20 German steamers loaded with ores and metals have taken refuge in the port of Lulea, and that a good many are likewise held up at Oxelösund. In some quarters here it is thought that these operations have been started too late to be of much use in affecting the German supply of Swedish iron ore, as Germany has for many months been importing this ore as fast as the mines could turn it out, but we do not accept that view. On the contrary, we think that if our submarine activity in the Baltic continues Germany will soon find herself short of hematite ore, a commodity which is indispensable to her munitions industry.

Two trains made up of sixty carloads of agricultural machinery have been shipped by the Massey-Harris Company from its plant at Brantford, Canada, for use in France. The machinery will be shipped from New York. War for some time had cut off the export trade of this company, but lately it has picked up and it is evident that more machinery is being imported by France to take the place of men who are on the firing line.

A sand-blast room with exhaust through a grating in the floor of the room is illustrated in the October bulletin of the Committee on Safety and Sanitation of the National Founders' Association, M. W. Alexander, West Lynn, Mass., chairman. The bulletin as a whole is devoted to sand blasting and other dusty operations.

A little leaflet of rules covering the duties of such officials of industrial plants as the factory manager, superintendent, foreman and mechanical engineer, and designated as Shopology, has been printed by the Bantam Anti-Friction Company, Bantam, Conn., W. S. Rogers, president. A copy may possibly be had for the asking.

The Canada Cement Company, Montreal, which recently received a large order for the manufacture of shells, will install an electric furnace for the purpose of making the steel required.

The Society to Promote the Science of Management will hold its annual meeting in New York City on Dec. 10 and 11 at the Engineering Societies Building, New York City.

Machinery Markets and News of the Works

NO LESSENING OF DEMAND

Domestic Requirements Growing Heavier

Small as Well as Large Plants Are Being Extended to Increase Production—War Contractors and Automobile Makers Most Active

Getting a sufficient number of machines to fill orders continues to be the big problem with the machine tool trade in every section of the country. Added to the pressure of war demand is a large amount of inquiry from industrial sources. A pleasing phase of the situation is a larger number of additions to the smaller shops and factories. Notable in the New York market are items stating that the Simplex Automobile Company, New Brunswick, N. J., is buying about $100,000 worth of machine tools, also that the Morrow Mfg. Company, Elmira, N. Y., has let a contract for four large one-story buildings. The Simms Magneto Company, East Orange, N. J., is erecting two additions to provide for additional output. In the Philadelphia district the Birdsboro Steel Foundry & Machine Company is making extensions to its plant and will require various machine tools.

J. G. White & Co., Inc., New York, have put inquiries before the trade for a large list of machine tools for export. It is reported that the American Brake Shoe & Foundry Company has a large order for shells. The General Railway Signal Company, Rochester, N. Y., will build an addition costing $80,000 to facilitate the filling of munitions orders.

The Yale & Towne Mfg. Company, Stamford, Conn., has advanced wages 10 per cent. The Morgan Mfg. Company, Newport, R. I., is in the market for a large number of tools.

In Cleveland the demand for lathes for shell work continues heavy, one maker having booked orders in a few days for 500 machines to be used on large shells. The Packard Motor Car Company, Detroit, Mich., has a list out covering its machinery requirements. Domestic business shows an improvement in Cincinnati, the automobile and truck manufacturers being the best customers. Contracts are being let for a six-story addition to the plant of the Huenefeld Company, Cincinnati, and later a miscellaneous lot of metal working machinery will be required. The demand is strong in Detroit for all lines of tools and machinery and manufacturers have been forced to increase their equipment. Many small extensions are under way in that city.

The Bukolt Mfg. Company, Milwaukee, Wis., maker of automobile specialties, is erecting a three-story factory, 74 x 700 ft. Miscellaneous items from Milwaukee show activity in that direction. The Nashville, Chattanooga & St. Paul Railway will increase the capacity of its car shops at Nashville, Tenn. The shops of the Illinois Midland Railroad, Taylorville, Ill., were recently destroyed by fire at a loss of $100,000. The Motsinger Device Company, Lafayette, Ind., maker of automobile accessories, has a contract for 1,000,000 time fuses.

Texas is now getting orders from Mexico. Favorable reports come from the Pacific Northwest. The Alaska Juneau Gold Mining Company, Juneau, Alaska, is planning improvements including the installation of mills and power plant to cost $1,500,000.

All Canada appears to be busy on shell contracts, some of which involve very large sums of money. Most of the recent orders call for the larger sizes of shells.

New York

NEW YORK, Nov. 17, 1915.

The situation in general is unchanged. The fact that the demand for machine tools exceeds the supply obtrudes itself on every side. Inquiries are coming in good number from every direction with the exception of the railroads, and here and there they are calling for a machine or two. Second-hand machinery continues to move actively. Collections are lagging a little, but in accounting for this the trade assumes that manufacturers are under too much pressure from other directions to pay much attention to bills. Many inquiries for one or two machines from industrial companies is taken as evidence that business apart from war activity continues to improve. Orders are being placed despite the fact that buyers will have to wait several months for deliveries. Automobile makers are particularly active in buying on long deliveries.

It goes without saying that the trade is intensely interested in the purchase by the R. B. Phillips Mfg. Company, Boston, of the National-Acme Mfg. Company, Cleveland, and the Windsor Machine Company, Windsor, Vt. The deals have been confirmed by a representative of the Phillips Company.

The Carbondale Machine Company, Carbondale, Pa., which has an office at 50 Church Street, New York, is in the market for seventy-five small screw machines for the execution of a fuse contract.

The Simplex Automobile Company, New Brunswick, N. J., has been inquiring for a list of machine tools representing a value of about $100,000, and already has placed some orders against the list.

J. G. White & Co., Inc., New York City, are in the market for a large and varied list of machine tools, understood to be for export to neutral countries.

The American Brake Shoe & Foundry Company, New York, is reported to have received an order for shells valued at several millions of dollars. The company has purchased some of the raw material necessary to fill the contract.

The Simms Magneto Company, East Orange, N. J., is erecting two additions of concrete and brick, one 42 x 70 ft., for its grinding and dipping department, and the other, 72 x 90 ft., for storage and shipping. These additions were made necessary by the need of more room for machinery equipment for its increasing output.

The Empire Repair & Electric Welding Company, 42 Whitehall Street, New York, plans the erection of a two-story brick machine shop, 110 by 200 ft., to be located at the foot of Thirty-fifth Street, Brooklyn. It will be operated for general repairing and marine equipment work and will take care of the over-pressure of work in its present shop at Twenty-sixth Street, Brooklyn, where it is employing about 400 men.

The Rome Wire Company, manufacturer of electric wires, Rome, N. Y., has increased its capital stock of $600,000 to $1,500,000. There will be no change in the management of the company. H. T. Dyett is president.

The Durham Duplex Razor Company, 590 Montgomery Street, Jersey City, N. J., has broken ground for a factory in Jersey City to be 125 x 200 ft., and to be erected at Baldwin Avenue and High Street at an approximate cost of $80,000, without equipment. Francisco & Jacobus, 200 Fifth Avenue, are the engineers. The John W. Ferguson Company, Paterson, N. J., is the contractor.

The Morrow Mfg. Company, Elmira, N. Y., has let general contract to the Compton Real Estate Company of that city for the construction of a tannery, 120 x 740 ft., one story; a heat-treating building, 167 x 450 ft., one story; a cooling building, 80 x 250 ft., one story, and a boilerhouse, 90 x 120 ft., one story, all of steel frame and brick construction, from plans made by Mills, Rhines, Bellman & Nordhoff, architects, 1234 Ohio Building, Toledo, Ohio.

The Todd Protectograph Company, Rochester, N. Y., has filed articles of incorporation with a capital stock of $2,000,000 to manufacture check protecting systems, office specialties, etc. L., G. W. and W. L. Todd, 1050 University Avenue, Rochester, are the incorporators.

The addition to be made to the foundry plant of the General Railway Signal Company, Rochester, to facilitate the filling of munitions orders will be 120 x 400 ft., one story, and will cost $80,000.

Crosby & Co., William and Pratt streets, Buffalo, have let contract for foundry addition, 35 x 125 ft., at their metal-stamping plant.

The King Sewing Machine Company, Buffalo, has let general contract for a small addition, brick and steel, to be made to its plant at Welland and Rano streets and the Lackawanna Railroad.

The Ross Heater & Mfg. Company, Buffalo, has filed incorporation papers with a capital stock of $15,000 and has taken over and will continue the business of the Ross Heater Company in the manufacture of patent heaters and expansion joints. Scott C. Ross and J. A. Magoffin of Buffalo and F. W. Gillett, New York City, are the incorporators.

The Curtiss Aeroplane Company, Buffalo, is making a further addition to its manufacturing plant at Austin and Kail streets and the New York Central Railroad, 80 x 300 ft., brick and steel, to cost $80,000.

The Catchpole Foundry Company, Geneva, N. Y., has let contract for erection of a 30 x 100-ft. addition to its foundry building.

New England

BOSTON, MASS., Nov. 15, 1915.

It is reported from Hartford, Conn., that the S. K. F. Ball Bearing Company will begin before Dec. 1 the erection of a plant on land recently purchased there. U. Forsberg, chief engineer of the Swedish company, has arrived in this country and will supervise both building construction and the early manufacturing operations. A statement issued by President B. G. Pritz of the local company announces that the business will be started with a fully paid-up capital of $2,000,000 and a board of directors comprising, besides himself, Frank A. Vanderlip of the National City Bank, New York; B. M. W. Hanson of the Pratt & Whitney Company; Franklin B. Kirkbridge of New York, and A. Carlson and F. Windquist of the Swedish company, which will be a large stockholder in the American company.

The Morgan Mfg. Company, Newport, R. I., is in the market for small size screw-slotting machines, automatic screw machines up to ½ in. in size, a small hand screw machine, Garvin No. 1 preferred. Offers should be accompanied by full particulars and if possible by illustrations.

The Hart & Hutchinson Company, New Britain, Conn., manufacturer of lockers, has filed a certificate of an increase of capital of 1000 shares at a par value of $100 a share. This makes the capital of the company $300,000.

The Central Tool Company, manufacturer of micrometer calipers and dental tools, has moved into its new factory on Wellington Avenue, Auburn, R. I.

The Berkshire Magneto Company, Pittsfield, Mass., has been incorporated with capital of $150,000 to manufacture high tension magnetos, taking over the magneto business of the Pittsfield Spark Coil Company. The incorporators are F. R. Shaw, E. T. Shaw and H. S. Birchard.

The Yale & Towne Mfg. Company, Stamford, Conn., has announced an increase in wages of 10 per cent; it became effective Nov. 15. It is reported that this increase affects about 4600 hands and will add to the payroll nearly $300,000 a year.

The Connecticut Telephone & Electric Company, Meriden, Conn., has awarded a contract for the erection of a five-story factory, 35 x 40 ft. The new building is needed to meet the demand for electrical equipment for automobiles.

Sleeper & Hartley, Worcester, Mass., makers of special machinery, have bought a large part of the equipment of the Union Machine Company, Worcester, and have leased new quarters in the Robinson Building on Prescott Street, where they will have greatly increased facilities.

The Lennox-Kinghorn Drop Forging Company, Rocky Hill, Conn., has been incorporated with capital of $50,000. The incorporators are William H. Lennox, George Kinghorn and William W. Lennox.

The Acme Belting Company, Boston, Mass., has been incorporated with capital of $30,000. John H. Jackson is president and treasurer.

The Shortell Iron Foundry Company, is a new corporation at Seymour, Conn., with capital of $50,000. The incorporators are William H., Frederick and Robert Shortell.

Philadelphia

PHILADELPHIA, PA., Nov. 15, 1915.

The Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa., manufacturer of castings, machinery, etc., has awarded contract to L. H. Focht & Son for the erection of a steel frame foundry, 60 x 240 ft., at Furnace and Main streets. It will be used for the manufacture of cast-iron sand and chilled rolls and alloy rolls of all sizes, and will have a capacity of from 600 to 800 tons a month. There will be leantos on each side to increase the molding floor space. The foundry equipment will include two cupolas, two air furnaces, one 30 tons and the other of 10 tons, 30-ton and 10-ton electric traveling cranes, etc. The finishing department will be equipped with lathes, grinding machines, etc. About 100 men will be employed in this department. Leon E. Thomas is general manager.

The Baldwin Locomotive Works, Broad and Spring Garden streets, Philadelphia, Pa., states that the actual loss to its building in the recent fire amounted to about $4,000, and that the patterns destroyed may be no real loss inasmuch as they may never be required again.

The Henry H. Sheip Mfg. Company, manufacturer of cigar boxes, Sixth Street and Columbia Avenue, Philadelphia, which owns a factory on Fifth Street, above Oxford, has purchased from Sophia M. Reineke the five-story factory adjoining, at 1632 North Fifth Street, 48 x 190 ft., for $20,200.

It is reported that orders for war munitions have been placed recently with the National Automatic Press Works, Lehighton, Pa., which has been converted into a munition plant by the Bethlehem Steel Company, and that the working force is being increased. The plant will work day and night.

The Danville Structural Tubing Company, Danville, Pa., with a capital stock of $600,000, has been incorporated to manufacture structural tubing, succeeding an unincorporated company of the same name and same ownership. E. F. Price is treasurer and the following are the other directors: E. F. Price, Samuel C. Rebman, Carleton S. Wagner, Samuel L. Marks and J. Newton Pursell.

The Tioga Machine Company, Philadelphia, has been incorporated with a capital stock of $5,000 by Clarence M. Ayars and Hilborn Ayars, 3332 North Twenty-first Street, Philadelphia, and E. Walt Havens, 5231 Addison Street, Philadelphia, to manufacture hatchets, axes, etc.

The Belmont Hardware Company, Tunkhannock, Pa., has been incorporated with a capital stock of $20,000 by H. S. Harding, treasurer, and thirty-one others to manufacture hardware, locks, etc.

C. E. Bard, Paxtang, Pa., will build a two-story brick factory, 40 x 100 ft., for the manufacture of piano player actions. Mr. Bard was formerly with the Sigler Piano-Player Company, Harrisburg, Pa.

Baltimore

BALTIMORE, MD., Nov. 15, 1915.

A contract for the construction of a one-story foundry, 75 x 625 ft., for the Maryland Steel Company, Sparrows Point, Md., has been awarded the West Construction Company, Knickerbocker Building, Baltimore.

At a cost of about $25,000 a one-story warehouse, 479 x 692 ft., will be built by the Carnegie Steel Company, Bush and Wicomico streets, Baltimore.

A 500-ft. bulkhead and a monorail system are being constructed at the fertilizer plant of the Imperial Shell Company, Curtis Bay, Md. Other improvements will be made.

Day and night forces are being used at the Keystone Drop Forge Works, Delaware and Central avenues, Chester, Pa., to fill the large number of orders on hand.

The plant of the Continental Fibre Company, Newark, Del., is to be enlarged with an addition 40 x 280 ft.

A fully-equipped garage will be established at 13 Harrison Street, Baltimore, by George W. Rife, Maryland Casualty Building.

It is stated that the Poole Engineering & Machine Company, Woodberry, Md., is considering the manufacture of a new cotton gin.

The Enterprise Hardware Mfg. Company, Frederick, Md.,

which is building a plant for the manufacture of hinges, locks, etc., is seeking prices on second-hand machinery for it.

Plans are being made to build a brick plant at Staunton, Va., by the Staunton Brick Company. Electrically-operated machinery will be installed. W. A. Payne, Staunton, is secretary.

The City Point Ice Corporation, Alexandria, Va., is in the market for a 125-hp. horizontal return tubular boiler, second-hand preferred; a 25 to 35-kw. direct-current generator direct connected to steam engine; also a steam condenser for a 50-ton ice machine.

Chicago

CHICAGO, ILL., NOV. 16, 1915.

The promise of a lull in machine-tool demand has been shortlived and dealers again report a staggering activity. In this market the inquiry from Canadian shops that have taken recent ammunition orders has been important. Local manufacturers continue in their effort to provide equipment for contemplated plant extensions; but six months is an early delivery for new tools in the lines for which there has been the principal demand. The movement of second-hand tools continues heavy and with broadening out of requirements to all classes of tools the trade is becoming more evenly distributed than was the case for some time. The inquiry of the Lake Shore Railroad for its Elkhart shops had practically no circulation in this market and this appears to have been the only railroad business of importance recently offered.

The Chicago & Northwestern elevator to be erected at South Chicago for Armour & Co. will require a power plant of 4700 hp., furnishing power for exclusively electrical drive.

Public garages are being built, one 101 x 145 ft., for the Ogden Auto Sales & Garage Company, Ogden and Springfield avenues, Chicago, to cost $20,000, and one 60 x 125 ft., for J. A. Wolf, North Kedzie and Carmen avenues, to cost $8,500.

The Chicago Utilities Mfg. Company, Chicago, has been incorporated with a capital of $25,000 by Charles F. Spery, Erle S. Peterson and Henry G. Miller, 2415 West Congress Street, to manufacture machinery appliances.

The Barry Machinery Company, Chicago, has been incorporated with a capital stock of $10,000 by E. A. Cudahy, Jr., C. A. Barry and R. B. Webster.

The Chicago Metal Refining Company, Chicago, has been formed by Bernard J. Brown, 155 North Clark Street, Samuel Goldfarb and William Navigato. It is capitalized at $20,000.

The U. S. Ball Bearing Company, 2147 North Kolmar Avenue, Chicago, will erect a one-story power house at a cost of $15,000.

Morris & Co., meat packer, Chicago, is building a three-story boiler house, 50 x 94 ft., to cost $31,000.

The Holt Mfg. Company, Peoria, Ill., has let contracts for the erection of two additional buildings.

Fire at the shops of the Illinois Midland Railroad at Taylorville, Ill., destroyed the roundhouse, shops and offices, with an approximate loss of $100,000.

The factory of the Coulter Disk Company, Galesburg, Ill., which was recently destroyed by fire, will be immediately rebuilt. In some quarters the loss is given as about $110,000.

Work has commenced on the foundation for the new building of the Havana Metal Wheel Company, Havana, Ill. It will be about 85 x 240 ft., of fireproof construction, and when finished it will be equipped with new machinery of the latest pattern.

The Root & VanDervoort Engineering Company, Moline, Ill., has let contract for the construction of a factory, 88 x 128 ft., as an extension to its plant.

Ovid Dorris, city clerk, West Frankfort, Ill., will receive bids until Nov. 22 for the construction of a municipal waterworks system, which is to include horizontal and vertical centrifugal pumps, electric motors, etc.

The Murs-Fruland Auto Company, Ottawa, Ill., has been incorporated with a capital stock of $15,000 by Walter R. Mers, Melville W. Clark and Mels A. Fruland.

The Western Mfg. Company, Peoria, Ill., plans the erection of a factory for the manufacture of enameled aluminum ware. O. S. Rippeth is president.

Rochester, Minn., suffered the total loss of its electric light plant, estimated to be worth $150,000.

Holstein, Iowa, has voted bonds for $18,000 for the installation of a waterworks system.

The New Monarch Machine & Stamping Company, Des Moines, Iowa, has let contract for a two-story brick factory, 110 x 200 ft.

The Perkins Mfg. Company, Des Moines, Iowa, has been incorporated with a capital of $10,000, to manufacture machinery, mechanical devices, automobile accessories, etc. The incorporators are LeRoy Perkins, Harvey M. Strong and Vernon R. Seeburger.

The Wichita Tire Company, Wichita, Kan., has been organized with a capital of $600,000. It plans to build a plant at Wichita to cost about $500,000.

The Helwig Mfg. Company, St. Paul, Minn., maker of pneumatic tools and operator of a drop-forging plant, is planning to erect a new factory.

Detroit

DETROIT, MICH., NOV. 15, 1915.

The demand for tools and machinery in practically all lines of the metal manufacturing industry continues strong. Manufacturers who have been doubtful as to the advisability of adding to their facilities are being forced to expand by the large number of orders pouring in, and it is likely that there will be no slackening in the demand for machinery for some time. Another evidence of increased activity is the number of new companies incorporating to enter the manufacturing field. Labor troubles are still clouding the horizon, but new developments have been confined to the walkout of men from two small plants.

The Ainsworth Mfg. Company, Detroit, has been incorporated with a capital stock of $100,000 by Charles H. Ainsworth, Clarence H. Booth, Alonzo P. Ewing, and others, to engage in the manufacture of windshields and other automobile accessories. It has secured factory quarters and will install equipment at once.

The Columbia Castings Company, Detroit, has increased its capital stock from $30,000 to $100,000.

The Hehle Mfg. Company, Detroit, has been incorporated with $15,000 capital stock to do a general machine shop business. The incorporators are Charles F. Hehle, Francis J. Wallace and Harry C. Milligan.

The Automatic Carburetor Regulator Company, Detroit, has been incorporated with $15,000 capital stock to manufacture automobile accessories. The stockholders include George Holland, Louis A. Kreis and Fred A. Embleton.

The Romeo Foundry Company, Port Huron, Mich., has purchased the plant of the defunct Havers Motor Car Company and will utilize it as a branch factory.

The McClellan Refrigerating Machine Company, Chicago, has acquired a plant at Manistee, Mich. It will manufacture ice-making machinery.

The Kelton-Aurand Mfg. Company, Bay City, Mich., recently incorporated with $50,000 capital stock to manufacture furniture, is having plans prepared for its plant. The main manufacturing building will be 56 x 240 ft.

The Keeler Brass Works, Grand Rapids, Mich., has begun the construction of an addition, 112 x 230 ft., one and one-half stories. It specializes in the manufacture of brass novelties and furniture parts.

The Schwarze Electric Company, Adrian, Mich., is adding to its facilities by the erection of a building, 50 x 100 ft., to house the machine shop.

The Michigan Hearse & Motor Company, Grand Rapids, Mich., manufacturer of automobile hearses, is doubling its capacity by the erection of an addition to cost about $20,000. Equipment costing several thousand dollars will be purchased.

The New Aetna Portland Cement Company, Fenton, Mich., is improving its plant by the erection of a new engine room and the installation of an auxiliary power plant.

The Michigan Truck & Lumber Company, Holly, Mich., will erect a one-story addition, 70 x 76 ft. It manufactures automobile woodwork.

The Grand Rapids Wood Finish Company, Grand Rapids, Mich., has increased its capital stock from $30,000 to $200,000.

The American Enameled Magnet Wire Company, Muskegon, Mich., has acquired a factory site, 100 x 390 ft., and is having plans drawn for a modern factory building.

The Holland Furnace Company, Holland, Mich., is planning the erection of an addition to its foundry which will increase its capacity more than 50 per cent.

The Welch Mfg. Company, manufacturer of store equipment, Grand Rapids, Mich., is building a one-story addition to its machine shop, 80 x 150 ft., and a two-story addition to its wood-working department, 52 x 80 ft., both at its plant at Sparta, Mich. William H. Carr is plant superintendent.

Milwaukee

MILWAUKEE, WIS., Nov. 15, 1915.

An encouraging sign is the revival of development work in water powers in Wisconsin. Adverse legislation threatened to stop investments of this kind, but a modification of the severe restrictions has opened the way, and some heavy requirements for hydroelectric installations are in sight. A $2,000,000 project is awaiting permission to proceed. Automobile and parts manufacturers continue to enlarge facilities, but find difficulty in securing machine tools to fill their requirements. Some Milwaukee tool builders have received inquiries on possible requirements next July and August, but it has been impossible to make definite statements. Nearly all lines of industry are showing signs of brisk business, fabricators and erectors being busier than for many months.

The Kissel Motor Car Company, Hartford, Wis., has broken ground for an assembling building, of brick and mill construction, 71 x 315 ft., three stories, to be ready April 1. About 250 men will be added to the payroll. The erection of an office building has been deferred until spring, as all available men are employed on the assembling shop. Work on a new enameling building and warehouse addition has been completed.

The Graf Stove & Range Company, Silver Lake, Wis., has started operations with a force of fifty workmen. This number will be doubled when the plant is entirely completed. The Graf business was formerly located at Louisville, Ky.

The Oconto Falls Motor Car Company, Oconto Falls, Wis., has purchased the former Goggins machine shop building and moved it to adjoin its garage. It will be used to accommodate repair and machinery work.

The Sterling Tool Mfg. Company has been incorporated at Milwaukee by Joseph Mietus, Stanislaus Prazynski and Stanley Schultz to manufacture hand and power tools. The capital stock is $10,000.

The L. Lippow Company, North Avenue and Seventh Street, Milwaukee, will erect a $5,000 garage to be used principally for repair work.

The American Seating Company, Manitowoc, Wis., has decided to concentrate all production at Manitowoc and has abandoned its works in Buffalo, N. Y. An addition providing 15,000 sq. ft. of floor space has been made at Manitowoc. M. H. Murphy is manager.

The Neldner Hub Motor Company, Milwaukee, has been incorporated to manufacture mechanical devices for automobiles and other purposes. The capital stock is $25,000 and the incorporators are Stephen W. Neldner, John J. McJeskey and John S. Stover, attorney.

The Charles H. Warning Company, sheet metal contractor, Oshkosh, Wis., is taking bids on a two-story brick factory, 40 x 40 ft., costing $5,000, to be occupied by the Oshkosh Paper Box Company.

The A. O. Smith Company, Milwaukee, manufacturer of pressed steel frames, automobile parts, motor trucks, etc., will build a boiler house at its main plant, Twenty-seventh and Hopkins streets, to cost $35,000. It will be of steel and brick, 40 x 70 ft., 50 ft. high, and contain three 300-hp. boilers, and modern stoking, conveying and pumping equipment. The work is in charge of the Thomas S. Watson Company, consulting engineer, 1412 Majestic Building.

The Auto Truck Service Company, 946 Third Street, Milwaukee, has awarded the general contract for the erection of a steel and brick addition to its machine shop and garage to the Northwestern Bridge & Iron Company, Milwaukee. It will be 30 x 90 ft. in size.

The Bukolt Mfg. Company, 231 Third Street, Stevens Point, Wis., manufacturer of automobile specialties and appliances, is erecting a brick and frame factory, three stories, 74 x 100 ft. J. J. Bukolt is manager.

Fire at the plant of the Racine Iron & Wire Works, Racine, Wis., did about $6,000 damage. The Racine Electric Company, on the third floor of the same building, sustained a small loss.

Gardner & Lindberg, architects, 1130-1140 South Dearborn Street, Chicago, are in charge of plans and specifications for two large packing plants to be erected in Wisconsin. The Inter-County Co-operative Packing Company, New Richmond, Wis., will invest about $175,000, and the Farmers' Co-operative Packing Company, Madison, Wis., plans an investment of $200,000. Bids will be taken early in December.

The building being erected by the Standard Crucible Steel Casting Company, 719 Thirtieth Street, Milwaukee, will be used as a pattern shop and storage vault. It will be of brick and concrete, one story, 40 x 40 ft.

A. L. Ryer, Darien, Wis., is building a garage and repair shop, 44 x 100 ft.

C. C. Wedige has leased a garage and repair shop at Belmont, Wis., but plans to erect a permanent building in the spring. J. F. Gourlie is manager.

Cleveland

CLEVELAND, OHIO, Nov. 15, 1915.

The demand for lathes for shell work continues heavy. In the past few days a Cleveland company booked orders for over 500 additional single purpose lathes, mostly large machines, for 9 to 12-in. shells, these orders coming from three Eastern manufacturers. The Packard Motor Car Company, Detroit, Mich., which has been buying machinery recently for plant extensions, has a new list out. Locally the market is active, with a good scattering demand for single tools. The foreign demand has slackened, but inquiries are out from Russia for turret lathes. A good domestic demand exists for turret machines, mostly in single tools. Forging machinery is in good call, orders coming principally from the automobile field.

The Vichek Tool Company, Cleveland, maker of drop and hand-forged mechanics' tools, has completed a brick and steel addition to its plant, providing 15,000 sq. ft. of additional floorspace.

The Cleveland Galvanizing Works Company, Cleveland, has purchased an entire city block adjoining its plant, on which it intends to erect additions as soon as the leases expire. It manufactures weldless wire chain, sash and other chain of various types. Important additions to its line during the past few years has made it necessary to enlarge the present manufacturing facilities. The site acquired adjoins the Pennsylvania Railroad and has frontage on four streets.

The Ford Washer Machine Company, Cleveland, has been incorporated with a capital stock of $10,000 to manufacture hydraulic motors and washing machines. R. M. Calfee, John F. Wilson, and others, are interested.

The Penfield Mfg. Company, Painesville, Ohio, has been incorporated with a capital stock of $10,000 by S. H. Penfield, W. H. Collier, Harry E. Hammer, and others, to manufacture machinery.

The Kressler Automobile Company, Fostoria, Ohio, has been organized with a capital stock of $200,000 and has leased the plant of the Fostoria Stave & Barrel Company. P. J. Blaser, G. F. Kressler and Henry Oskchin are interested.

The National Drawn Steel Company, East Liverpool, Ohio, has increased its capital stock from $100,000 to $150,000 and plans to enlarge its capacity.

A machine shop will be established in Lima, Ohio, by Steiner Brothers, who will manufacture tools, jigs, fixtures and special machinery. A. P. and P. Steiner will be associated in the business.

The American Refractories Company, Pittsburgh and Chicago, has leased the plant of the Buckeye Portland Cement Company at Marl City, near Bellefontaine, Ohio, and will equip it for the manufacture of magnesite. Two steel buildings will be erected.

Indianapolis

INDIANAPOLIS, IND., Nov. 15, 1915.

The American Lathe & Press Company, Indianapolis, has filed articles of incorporation with $1,500,000 capital stock to manufacture machines, tools and instruments. The directors are Fred D. Bethard, Robert J. Breck, Frederick G. White, Lee Bykerman, Arthur Lindner, Clarence C. Talcott and Howard C. Hunt, all of Richmond, Ind., and as the promoters are not making their plans public, except that one of them has stated that the factory would be in Richmond, it is suspected the company will be a bidder for the plant of the M. Rumely Company in that city, which is to be sold at auction at LaPorte, Ind., by the receiver, Dec. 9.

The business of the Ohio Falls Iron Company, New Albany, Ind., has improved very much since Oct. 1, and the mills are working full time with 450 employees.

The South Bend Gear Company, South Bend, Ind., has been incorporated with $25,000 capital stock to manufacture gears. The directors are E. B. Clark, K. K. Knapp and A. E. Coon.

The Franklin Coil Hoop Company, Franklin, Ind., has changed its name to the Graham Mfg. Company and has increased its capital stock from $95,000 to $100,000.

The Woolley Mfg. Company, Anderson, Ind., has been incorporated with $10,000 capital stock to manufacture machinery, vehicles, motors and engines. The directors are William J. Woolley, Frank Fath, John C. Stephenson, Foust Childers and Charles C. Childers.

The Motsinger Device Company, manufacturer of automobile accessories, Lafayette, Ind., has secured a contract for 1,000,000 time fuses from one of the warring governments.

The Potts & Suits Mfg. Company, Indianapolis, has been incorporated to manufacture oil heaters. Bert C. Suits, John F. Potts and Edward W. Hohlt are the directors.

The Reliable Machine Company, Anderson, Ind., has been organized by C. A. Martindale, Samuel Magg and C. R. Rawlings with a capital of $10,000.

The Sisters of St. Francis, Oldenberg, Ind., are taking bids for a powerhouse to cost $22,000. J. J. Reuchert, 8 Allen Building, Cincinnati, Ohio, is the architect.

The International Iron & Steel Construction Company, Evansville, Ind., suffered a loss of $25,000 by fire.

The Edgerton Brick & Tile Company, Edgerton, Ind., has been incorporated with $30,000 capital stock to manufacture brick and tile products. The directors are Lee J. Hartzell, H. H. Tracht and K. J. Corkery.

The Standard Brick Company, Crawfordsville, Ind., has increased its capital stock from $100,000 to $175,000.

The Common Council, Montpelier, Ind., will receive bids Nov. 24 for a complete lighting system. D. A. Bryson is city clerk.

Cincinnati

CINCINNATI, OHIO, Nov. 15, 1915.

A conservative estimate of the number of men who returned to work last week is placed around 350, with indications that the present week will see the end of local labor troubles. Reports from Hamilton, Ohio, also indicate a resumption of activities in idle shops. From Dayton, Ohio, is reported a dispute in one foundry with the molders, which resulted in about half of them walking out.

Confirmation cannot be had of rumors that several local machine tool builders have received rush orders for machines to take the place of those destroyed in the recent fire at the Bethlehem Steel Company's plant. It is known, however, that domestic business has improved, with the automobile and auto-truck manufacturers the best customers. The foreign demand is slowly declining, and many firms are making special efforts toward getting established for future business rather than to load up on war orders. It is the opinion of several leading machine tool manufacturers that Russia will prove an excellent market for machine tools and all kinds of machinery as soon as the war is ended. Others are convinced that the South American field has been underestimated.

The jobbing foundries are busy, and stove foundries have also increased activities. Wood-working machinery is in better demand, especially in the South. The boiler and tank business is also good. The domestic and foreign call for portable electric drilling machines is rapidly increasing.

The Hess Spring & Axle Company, Cincinnati, has let contract for the structural work on its addition to the Riverside mills, Martins Ferry, Ohio.

Contracts are being let for the addition to the plant of the Huenefeld Company, Cincinnati, and work will be commenced at an early date. It will be 100 x 246 ft., six stories and basement. A miscellaneous lot of metal-working machinery will be required later.

Repairs to the plant of the Ohio Pattern Works, Cincinnati, damaged by fire two weeks ago, are being rapidly made. No damage occurred to the foundry and deliveries have been made on contract time.

It is denied that the Recording & Computing Machines Company intends to remove its plant from Dayton, Ohio, to Indianapolis, Ind.

The Greater Dayton Association, Dayton, Ohio, has completed plans for an industrial exposition to be held in that city Jan. 14 to 22 next. Special efforts will be made to have a large machinery exhibit, especially in the machine tool line.

The John Rouzer Company, Dayton, Ohio, has secured contract for the plant of the Ohio Metal Products Company, Dayton. Work will commence immediately. It is reported that most of the new plant will be given over to the manufacture of war munitions.

It is reported, but not confirmed, that the addition to the plant of the Davis Sewing Machine Company, Dayton, Ohio, will be devoted almost entirely to the manufacture of aeroplanes. Blair & Co., New York financiers, recently obtained control of the company, but it is stated no changes will be made in the operating officials.

The Midland Engineering Company, Columbus, Ohio, has been incorporated with $10,000 capital stock to manufacture machinery, locomotives, and structural and bridge materials. F. S. Knox and R. J. Odell are among the incorporators.

The Ironton Boiler Works Company, Ironton, Ohio, has been organized to operate the boiler plant of the Ironton Punch & Shear Company, the latter to devote all of its time to its foundry and machine shop departments. P. Meehan is general manager of the Ironton Boiler Works Company.

The Penfield Mfg. Company, Painesville, Ohio, has been incorporated with $10,000 capital stock to manufacture machinery. S. R. Penfield is the principal incorporator.

The city of Newark, Ohio, has voted a $30,000 bond issue for an addition to its electric lighting plant.

St. Louis

ST. LOUIS, MO., Nov. 15, 1915.

Conditions in the machine-tool market show that the pressure for equipment is becoming stronger. In the demand for tools for domestic lines a marked improvement has set in, but here, too, the supply is curtailed. Shoe manufacturers, for instance, are finding difficulty in filling some of their needs, and this is true of other lines which one would scarcely, so far as machinery required is concerned, expect to find in delivery trouble. Business conditions continue to improve and the trade in St. Louis territory is reported in the soundest condition within memory. The improvement is reported fundamentally solid, no speculative features attaching to the situation. Money continues easy at low rates. Collections are very good. Investment funds are more easily found.

The Ford Feed Mill & Mfg. Company, Kansas City, Mo., has been incorporated with a capital stock of $14,000 by R. M. and R. E. Bruner and F. M. Patrick to manufacture agricultural and other implements.

The Efficiency Oil Corporation, Kienlen Avenue, St. Louis, Mo., has acquired the plant of the Shiras Electric Company and will remodel it. New equipment will be needed.

The Texas Utility Company has acquired water, light and ice plants at Plainview and other points in Texas and will expend about $125,000 on electrical apparatus. Hugo Wurdack, St. Louis, Mo., is president.

The Great Western Garage & Repair Company, St. Louis, Mo., has been incorporated with a capital stock of $15,000 by Fred W. Darling, Arthur P. and Oscar H. Hentschell.

The St. Louis Fiber Company, St. Louis, Mo., recently incorporated, is in the market for equipment for the manufacture of guncotton.

The McKenzie Mfg. Company, St. Louis, Mo., will equip a plant for the manufacture of wire curtain rods with a capacity of about 75,000 a week. J. B. Horstman, 2820 Clark Avenue, St. Louis, is president.

The mill, shop and coach repair annex of the reclamation plant of the St. Louis & San Francisco Railroad at Springfield, Mo., were totally destroyed by fire. It is estimated that the loss to building, machinery and contents will reach $45,000.

The Hannibal Wire Fabric Company, Hannibal, Mo., has let contract for four brick structures, one 150 x 265 ft., a second 34 x 90 ft., another 30 x 60 ft., and the fourth 70 x 150 ft., which it hopes to have ready for occupancy early in February.

The Trenton Gas & Electric Company, Trenton, Mo., will erect a new building for its electric plant and new generators and fuel-oil engines will be installed. The gas plant is to be remodeled and extended at a cost of $25,000, and an ice plant built which will cost $36,000.

The Carrom Quarry & Mfg. Company, Brickeys, Mo., has been incorporated with a capital stock of $15,000 by Theodore Carrom, R. E. Rombauer and Frank Roster, and is in the market for quarrying and stone-manufacturing machinery.

The Gyp Steel Products Company, Kansas City, Mo., has been incorporated with a capital stock of $20,000 by James P. Sprague, J. A. Henley and James Mularkey.

The Fountain Brush Company, Kansas City, Mo., has been incorporated with a capital stock of $50,000 by C. A. Thompson, J. G. Brinkman and C. A. Brunker.

Poplar Bluff, Mo., will install an electric power plant to cost $60,000, about $45,000 being for machinery. The Fuller-Coult Engineering Company, St. Louis, Mo., is in charge.

Schell City, Mo., has granted a twenty-year franchise to E. T. Hartje for supplying electric light and power and he will proceed with the installation of the necessary equipment, for which he is in the market.

The Springfield Ice & Refrigerating Company, Springfield, Mo., B. E. Meyer manager, will erect a cold storage warehouse to cost $200,000. The machinery will cost $125,000.

The Earle Light, Water & Ice Company, Earle, Ark., will equip a 15-ton ice plant and an electric light and power plant.

Pocahontas, Ark., plans to equip a waterworks plant and pumping station.

A stave and heading plant will be equipped at Des Arc, Ark., by Wirthlin & Franz, Minturn, Ark.

The Cotton Growers' Gin Company, Lawton, Okla., has been incorporated with a capital stock of $11,000 by E. T. Head, C. R. Avery and B. T. Head.

C. I. Huffaker will equip an electric light and power plant at Fairfax, Okla., including one 40-hp. oil engine, one 30-kw. three-phase alternating-current generator, etc.

An electric lighting system to cost about $15,000 has been decided upon for Goltry, Okla., by the city board of trustees. The Benham Engineering Company, Oklahoma City, will draw plans.

The Tulsa Boiler & Machinery Company, Tulsa, Okla., has been incorporated with a capital stock of $100,000 by J. M. Hughon and T. C. Kotter, Tulsa, and J. E. Carnahan, Clinton, Ohio. It will equip a plant.

The Stillwater-Pawnee Gas Company, Stillwater, Okla., will install about $225,000 worth of pipe-line and pumping equipment and about 1600 meters, all of which is being sought.

The Best Ink Company, Oklahoma City, Okla., has been incorporated with a capital stock of $25,000 by M. F. Meadows, Charles D. Sautbine and W. F. McClung, and will establish a plant for grinding and mixing inks.

The Claro-Cola Company, New Daniel Building, Tulsa, Okla., is in the market for a power plant and syrup-making machinery. Six ½-hp. motors, one 20-hp boiler, etc., are wanted.

The Success Motor Car Company, Muskogee, Okla., has been incorporated with a capital stock of $15,000 by George J. and R. W. Stoutz and Robert A. Otis.

Cleveland, Okla., will expend about $125,000 on a waterworks and a filtration plant. A. C. Moore, Joplin, Mo., is the engineer in charge.

The McComb & Magnolia Light & Railway Company, McComb, Miss., will build a power plant for its interurban road. H. W. Bell, Laurel, Miss., is the enginer in charge, and A. H. Jones is general manager.

An electric light plant and a waterworks plant to cost $18,000 will be constructed at Wesson, Miss. M. L. Culley, Jackson, Miss., is supervising engineer.

The Pioneer Pole & Shaft Company will equip a wood-working plant near Houlka, Miss., to work up hickory.

A waterworks plant will be erected at Philadelphia, Miss., to cost about $30,000. M. L. Culley, Jackson, Miss., is the engineer.

A waterworks plant to cost about $100,000 will be built at Pass Christian, Miss., with Xavier A. Kramer, Magnolia, Miss., as the engineer.

White Castle, La., will establish a waterworks and an electric light plant to cost about $25,000. Xavier A. Kramer, Magnolia, Miss., is supervising engineer.

Opelousas, La., A. C. Jones, superintendent of plant, is in the market for an oil engine-driven alternating-current generator, a direct-connected motor pump for deep well service, etc.

The Long Bridge Cotton Oil Company, Long Bridge, La., has lost a plant by fire, about $35,000 of equipment being destroyed. It will be replaced.

The city of Shreveport, La., has voted $1,200,000 bonds for waterworks and sewer systems and the work will be done under the direction of the mayor, S. A. Dickson, in its preliminary stages.

The Illinois Central Railroad, whose general offices are at Chicago, is reported to have plans for a car building plant at McComb City, Miss.

Birmingham

BIRMINGHAM, ALA., Nov. 15, 1915.

A good business is reported by wholesale machinery and machine tool dealers. Wood-working machinery is in quite active demand and the call from mines has improved. Gasoline engines and hydroelectric apparatus are active. The increase in the volume of business is considerable.

A persistent report with apparent foundation exists at Birmingham that plants for the manufacture of dyestuffs and high explosives are to be established in the vicinity of the benzol plants of the Woodward and Edison companies at Woodward, Ala. Another equally persistent one is that a benzol plant is to be established at Ensley in connection with the by-product works of the Semet-Solvay Company.

The Riverside Compress Company, Augusta, Ga., will rebuild the cotton compress recently burned, at an estimated loss of $500,000.

The Central South

LOUISVILLE, KY., Nov. 15, 1915.

Machinery manufacturers continue to operate at full capacity and many plants are being enlarged. The export machine-tool trade is good. Generators and motors are not selling so well, but prospects are excellent. Manufacturers of drop forgings are unusually busy and running to capacity, being probably the most active of local iron manufacturers. The demand for boilers is improving.

D. H. Ewing's Sons, Third and Breckenridge streets, Louisville, are having plans drawn by John B. Hutchings, Columbia Building, for a dairy plant. A steam power plant is contemplated and twenty-two motors, aggregating 110 hp., will also be required. It will install an ice machine and refrigerating equipment, in addition to special machinery.

The Roy C. Whayne Supply Company, Lincoln Building, Louisville, is asking for prices on a locomotive crane or traveling derrick car with a 70-ft. boom for construction work.

The Indiana Veneer & Panel Company, New Albany, Ind., has plans for doubling its capacity. Additional power equipment, including electric motors, will be bought, besides wood-working machinery.

The Kentucky Public Service Company, Bowling Green, Ky., has plans for an ice factory and cold storage plant. Henry D. and Roland Fitch are in charge.

Providence, Ky., will issue $20,000 of bonds for a municipal electric light plant.

The American Metallic Packing Company, Lexington, Ky., is in the market for a second-hand cableway carriage.

J. H. Russell and Aubrey Heath, Clay, Ky., are asking for prices on equipment for an ice factory to be established at Rector, Ark.

The main plant and planing mill of the International Steel & Iron Company, Evansville, Ind., were burned recently with a loss of $50,000.

The plant of the Gill Clay Pot Company, Muncie, Ind., was burned recently with a loss of $100,000. It will be rebuilt.

The Robinson-McGill Company, Nashville, Tenn., has purchased a site in Fayetteville, Tenn., and will build a two-story factory to manufacture buggies.

C. E. James, Chattanooga, Tenn., is building a hydroelectric power plant on Middle Creek.

J. B. Palmer, Nashville, Tenn., will build a garage and equip a repair shop.

The Hardwick Stove Company, Cleveland, Tenn., will double the capacity of its foundry. The present output is 800 stoves a week.

Texas

AUSTIN, TEX., Nov. 13, 1915.

Orders for machinery and tools for Mexico are being filled by dealers in San Antonio and El Paso. Reports indicate that the revival of industrial activities in that country is rapidly assuming a large scope. The machinery and tool trade in Texas and the Southwest has improved.

The Keystone Steel & Wire Company, Peoria, Ill., will establish Southwestern headquarters in Dallas under the name of the Texas Keystone Steel & Wire Company, which has been organized with a capital stock of $20,000 by H. W. Bartlett and L. E. Burgess of Dallas, P. W. and B. L. Sommer and H. G. Moore of Peoria, Ill.

The Young Men's Business Club, Marshall, has secured options on land to be used by the Texas & Pacific Railroad as a site for its proposed enlarged shops.

The El Paso Smelting & Refining Company, El Paso, will begin the erection of its new steel building and the installation of converters and a traveling crane at its smelter. These and other improvements will cost about $300,000.

The Leon Springs Irrigation Company plans to construct a reservoir and install a pumping plant for irrigating 2017 acres of land in the Leon Springs Valley near Marfa.

J. A. Pool, Marfa, will build a reservoir and install a pumping plant to irrigate 900 acres of land in the Charco Becerro Valley, in Presidio County.

The Texas Land & Development Company, Plainview,

plans to drill more than fifty wells in that section and to install pumping plants. These are in addition to the wells and irrigation pumping plants that have already been finished. J. W. Longstreth is general manager.

The Gulf Mehaden Company, Corpus Christi, has been reorganized under the name of the Fisheries Company and will build a canning plant and fish oil factory upon St. Joe Island. The machinery will include three engines, each of 450 hp. W. L. Moody, Jr., Galveston, is president.

Max Deutz, Laredo, will install an irrigation pumping plant.

The Texas Portland Cement Company, Dallas, has increased its capital stock from $750,000 to $1,000,000 and will make improvements to its plant.

The White Elephant Irrigation Company, Marfa, plans to construct a water storage reservoir of 5,333,660 cu. ft. and to install a pumping plant for irrigating 200 acres of land.

The lumber mill of the West Lumber Company, Onalaska, recently destroyed by fire, entailing a loss of about $250,000, will be rebuilt.

George Kline, El Paso, plans to build a meat packing plant.

The Emmet Brick & Tile Company, Gonzales, which was recently reorganized with a capital stock of $30,000, will install new machinery in its plant. C. B. Robertson is in charge.

I. R. Kelso, St. Louis, Mo., and associates, have taken preliminary steps toward constructing an electric power station, waterworks plant and ice factory at Plainview to cost not less than $1,000,000, in Plainview and other towns of Texas. Power for operating irrigation pumping plants and for other industrial purposes will be furnished. H. C. Randolph, Plainview, is also promoting the project.

The Pacific Northwest

SEATTLE, WASH., Nov. 9, 1915.

Signs of improvement in the lumber industry are responsible for a much better feeling through the Pacific Northwest, that being about the only important industry of this section that is still below normal. Large buyers are getting into the market and reports from domestic consuming markets are most encouraging. Figures from the Southern Pacific Railroad show a marked increase over last year in cars loaded in the Portland division, the increase being principally in lumber, and renewed activity in all lines has caused a temporary shortage of cars. The interior mining districts are busier than for several years, and many new inquiries for mining and reduction equipment are still appearing, both from this section and from Alaska. The outlook is favorable for further expansion of business in implements, irrigation supplies and power units for agricultural use. Somewhat more interest is shown in machine tools, but orders are only being placed where the need is fairly imperative.

J. A. Veness, Winlock, Wash., has let a general contract for the reconstruction of a sawmill recently destroyed by fire. The new mill will be of 100,000 ft. a day capacity.

The city of Seattle, Wash., is taking bids for a 250-hp. impulse steam turbine.

Further details have been given out by the Alaska Juneau Gold Mining Company, Juneau, Alaska, of the improvements planned at its properties. Two crushers, tube mills, two compressors, classifiers, concentrators are to be constructed, and a power plant costing $500,000, to generate 4500 hp., with reinforced concrete powerhouse, will be erected. The completed improvements will cost $1,500,000. The company's headquarters are in San Francisco, Cal. Fred W. Bradley is manager.

A machine shop will be built in Seattle at 1506 Eleventh Avenue by John Bacchus. Contract for the construction of the building has been awarded and the shop will be ready for operation before Jan. 1.

The Lucky Boy Mining Company, Boise, Idaho, plans to immediately install machinery, including a 100-hp. crude oil engine, direct connected to a 55-kw., 250-volt electric generator.

A complete water system to supply Lakeside, Ore., will be installed by S. B. Cathcart of that city. Surveys for the system, which will cost approximately $10,000, are being made.

The Winlock Mill Company, Winlock, Wash., whose sawmill plant was destroyed by fire recently, has awarded contract for its reconstruction to Louis Livingstone, Winlock. The construction work will begin at once and will be completed in about five months. The new plant will have a capacity of 100,000 ft. per day.

The sawmill of the Spokane Lumber Company, Milan, Wash., including planer, dry shed and sawmill, was completely destroyed by fire with a loss of $150,000.

The Standard Oil Company has announced through its Seattle manager, John McLean, that three steel oil tanks, warehouse and office building will be constructed in Port Angeles at a cost of $75,000.

The Seattle port commission, of which C. E. Remsberg is secretary, has approved plans for the refrigerators and machinery to be installed in the fish cold-storage warehouse under construction by the commission. The equipment will cost about $30,000 and bids will be called for soon.

The Spaulding Logging Company, Newburg, Ore., plans the erection of a plant for the manufacture of Indiana type of silos. G. O. Bassett is manager.

Canada

TORONTO, Nov. 13, 1915.

Canadian shops and factories will probably be engaged in the manufacture of big guns for the British Government within a few weeks. The steel gun barrels, it is said, will be forged in the maritime provinces, where there is a plant capable of undertaking the work. Various firms will be given contracts for the manufacture of different parts and a large ordnance factory will be established at some central point, probably in Montreal, at the Armstrong-Whitworth Corporation plant. J. H. Whitfield and M. J. Butler, representatives of the company, are in Ottawa.

The last of the new orders for munitions, aggregating $80,000,000, were sent out recently to manufacturing firms in various parts of Canada. The munitions committee has been advised as to the capacity of each plant, and orders relative to capacity have been awarded. Every factory large or small, capable of manufacturing munitions of war, is receiving orders. A wholesale manufacture up to the greatest possibility of output by Canada in the shortest possible time has been thoroughly planned.

The Steel Company of Canada, Hamilton, Ont., has received orders for the manufacture of large and small shells, and will install some new machinery to handle the work.

The Montreal Tramways Company, Montreal, which has been engaged in the manufacture of small shells, has received an order for large shells aggregating over $1,000,000 in value.

The Imperial Steel & Wire Company, Collingwood, Ont., has contracted with the British War Office for a supply of munitions and special articles used in trench warfare. The contract price is about $5,000,000.

Bombs have been added to the munition products which Canada is now producing for the British War Office. An order for 5000 of these projectiles has been received by the commission and is to be placed for speedy delivery. The bombs are to be used in trench warfare and are to be fired from mine or trench guns.

It is said that the Angus shops of the Canadian Pacific Railway Company at Montreal will be used as an assembling plant for big guns for the British Government.

Hamilton, Ont., will construct an auxiliary steam power plant. S. H. Hent is clerk.

The Fort William Coal Docks Company, Fort William, Ont., will build an extensive addition to its plant on Mission River to cost $200,000.

Regina, Sask., will install a new pumping unit at its waterworks plant to be driven by electricity and have a capacity of 2,500,000 gal. per day and to cost $12,000. George Beach is the clerk.

The Villeneuve Machine Gun Company, Ltd., LaTuque, Que., has been incorporated with a capital stock of $99,000 by J. E. Desbiens, D. E. Hardy, J. D. Vilandre, and others, to manufacture machine guns, etc.

The Transcona Shell Company, Ltd., Montreal, Que., has been incorporated with a capital stock of $50,000 by Francis G. Bush, George R. Drennan, Michael J. O'Brien, and others, to manufacture shells, ammunition, etc.

The Gray-Dort Motors, Ltd., Chatham, Ont., has been incorporated with a captial stock of $500,000 by Robert Gray of the Gray-Campbell Company, and Manson Campbell, Chatham, Ont.; Josiah D. Dort and David M. Averill of Flint, Mich., and others. It will establish a factory at Chatham to manufacture automobiles, accessories, etc.

The Eclipse Iron Works, Ltd., Vancouver, B. C., has been incorporated with a capital stock of $20,000 to manufacture iron, steel, machinery, etc.

The Canadian Tygard Engine, Ltd., 202 Royal Bank Building, Toronto, has purchased the old Ontario House on Kingston Road for a factory for the manufacture of engines

for aeroplanes and submarines. Machinery will be installed in the present buildings and operations carried on until new buildings can be erected. James W. Tygard is president.

The Utilities Equipment Company, Ltd., Toronto, has been incorporated with a capital stock of $40,000 by William Davidson, 23 Adelaide Street East, Toronto; John C. McFarlane, Alexander McKenzie, and others, to manufacture electrical machinery, etc.

The Ontario Aeroplane Company, Ltd., Toronto, has been incorporated with a capital stock of $200,000 by Jacob W. Broudy, care of Holliss & Wilson, Temple Building, Toronto; William L. Holmes, William R. Bird, and others, to manufacture aeroplanes, etc.

The Roxton Falls Mfg. Company, Ltd., Roxton Falls, Que., has been incorporated with a capital stock of $100,000 by Joseph O. Fauteux, Joseph A. Desmarteau, Verdun, Que.; Ernest P. Matte, Montreal, and others, to manufacture iron, copper, malleable iron, machinery, etc.

The Central Engineering Company, Ltd., Montreal, Que., has been incorporated with a capital stock of $25,000 by Thomas Arnold, Joseph Atter, Westmount, Que.; Arthur W. Horsey, Longueuil, Que., and others, to manufacture rails, machinery, locomotives, tools, etc.

The Canadian Fairbanks-Morse Company, Bloor Street, West, Toronto, has secured a contract from the government to manufacture shells to cost $2,000,000.

The steam generating plant of the Canadian-Klondike Mining Company, Dawson, Y. T., Canada, was completely destroyed by fire Oct. 30. The plant was used for driving dredges, heating the company's shops, etc. The machinery burned included three large water-tube boilers and a 400-kw. turbine engine. The plant is to be rebuilt on a larger scale.

The molding shops of the Vancouver Engineering Works, Vancouver, B. C., were damaged in a recent fire.

Government Purchases

WASHINGTON, D. C., Nov. 15, 1915.

Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, Nov. 30, schedule 8989, two 14-in. x 6-ft. cone drive lathes, and schedule 8976 for three milling machines, all for Washington; schedule 8997, for twelve 1000-lb. folding platform scales, and schedule 8998, for twelve 600-lb. platform scales, all for Brooklyn. Bids were received by the Bureau of Supplies and Accounts, Navy Department, Washington, Nov. 9, for supplies for the Navy Yard as follows:

Schedule 8903, Ordnance

Class 62, Washington—One universal grinding machine—Bid 34, $790; 107, $940.

Class 63—Washington—Two feed wire screw machines—Bid 34, $2,122.

Schedule 8906, Construction and Repair

Class 72, Norfolk—Two polishing and buffing lathes—Bid 15, $265; 67, $90; 80, $345; 122, $237 and $229.

Schedule 8909, Ordnance

Class 91, furnishing and erecting forging furnace at the Navy Yard, Washington, D. C.—Bid 10, informal; 135, $3,910 and $3,735.

Schedule 8912, Steam Engineering

Class 111, Norfolk—One rotary shear—Bid 203, $2,750.

Class 112, Norfolk—One power gap shear—Bid 18, $1,589, $1,579, $1,569, $1,489, $1,479 and $1,469; 122, $1,670; 143, $1,825; 182, $1,900 and $1,920.

Schedule 8913, Construction and Repair

Class 121, Brooklyn—Four blowers—Bid 38, $223.50; 78, $197.50; 185, $236; 216, $1,061.50, total.

The names of the bidders and the numbers under which they are designated in the above list are as follows:

Bid 10, American Shop Equipment Company; 15, Charles J. Bogue Electric Company; 18, Bertsch & Co.; 34, Brown & Sharpe Mfg. Company; 38, the Cutler-Hammer Mfg. Company; 67, Excelsior Tool & Machine Company; 78, General Electric Company; 80, Gardner Machine Company; 107, Kemp Machinery Company; 122, Manning, Maxwell & Moore; 135, Mircs Fuel Oil Equipment Company; 143, Niles-Bement-Pond Company; 182, the D. H. Stoll Company; 185, B. F. Sturtevant Company; 203, H. Collier Smith; 216, Westinghouse Electric & Mfg. Company.

The United States Engineer Office, Burke Building, Seattle, Wash., will receive bids until 11 a. m., Nov. 20, for one gantry cantilever crane and two electric hoists.

Bids will be received by the general purchasing officer of the Panama Canal, Washington, until Nov. 30, under proposal 2045, for furnishing an automatic pneumatic ejector of 150 gal. per min. capacity.

NEW TRADE PUBLICATIONS

Structural Iron and Steel.—Republic Structural Iron Works Company, 1270 East Fifty-third Street, Cleveland, Ohio. Vol. 1, No. 2 of the Republic Structural News, which is the form in which the company is issuing its monthly price list. The products listed include light joist hangers, I-beams, channels, angles, plates and concrete reinforcing bars. Lists are presented of the different sizes, together with the weight per foot and the amount of stock on hand. Mention is made of concrete reinforcing specialties and a line of manhole covers and rings. A partial list of the company's products arranged in alphabetical order is included.

Belt Compound.—Pulley-Grip Company, Hathaway Building, Milwaukee, Wis. Folder. Deals with a preparation for increasing the pulling power of belts. This compound is applied to the surface of the pulley and the advantages claimed for its use are the prolonging of the life of the belt, the prevention of slippage and the elimination of burnt out belts. Brief instructions for its use and a number of testimonial letters are included.

Cooling Ponds.—Spray Engineering Company, 93 Federal Street, Boston, Mass. Pamphlet. Contains a reprint of a paper on "Cooling Ponds for Condensing Engines," read before the National Association of Cotton Manufacturers, and traces the development of the utilization of cooling ponds from the natural ones to the artificial ones employing spray nozzles for discharging hot water from the engines. Numerous typical installations of the spray system in connection with cooling ponds are illustrated.

Wrought-Iron Moldings.—Julius Blum & Co., 510 West Twenty-fourth Street, New York City. Catalog No. 1. Illustrates and describes a line of hot rolled wrought-iron shapes for use in building construction which includes plain and ornamental moldings, door saddles, hand rails, step and stair tread nosings, sash and skylight bars and forged pickets, pearl bars, ornaments, etc. There is practically no text in the catalog, views of the various forms that can be supplied being presented with dimensions. Mention is also made of a line of oxy-acetylene and cutting outfits and shearing machines of various types.

Fuel Economizers.—B. F. Sturtevant Company, Hyde Park, Boston, Mass. Booklet. Points out by an illustration the various advantages of a fuel economizer which is built for working pressures up to 300 lb. per square inch. Among these are the use of metal-to-metal joints throughout, ability to arrange for either forced or natural circulation, a staggered arrangement of the pipes which is relied upon to remove heat from the gases more effectively and ability to replace a pipe, header or manifold without disturbing any other part of the economizer. A partial list of users is included together with a number of views of actual installations.

Rotary Bluing Furnace.—Henry Perkins & Company, Bridgewater, Mass. Circular. Illustrates and describes an internally heated rotary bluing furnace for tacks and nails. The furnace requires no foundation or brickwork, and as the heat is applied directly to the tacks or nails it is emphasized there is no tendency for the barrel to burn out. An illustrated description of the furnace appeared in THE IRON AGE, June 10, 1915.

Oil and Waste Reclaimer.—Oil & Waste Saving Machine Company, 1509 Real Estate Trust Building, Philadelphia, Pa. Circular. Treats of a machine for separating and reclaiming the oil and waste used for wiping machinery. An illustration of the machine, which operates on the principles of centrifugal force and heat is presented, the various parts being lettered to furnish a ready means of identification. A brief description of the machine, which is built in four sizes, is given together with a table of specifications.

Gears and Friction Clutches.—A. Plamondon Mfg. Company, Chicago, Ill. Catalogs Nos. 56 and 57. The first relates to a line of standard cast-iron spur, bevel and miter gears and spur, bevel, miter and hunting cog mortise gears. An illustration of each of the several types of gears is presented followed by a table giving the sizes that can be furnished for the different pitches. Diagrams showing the dimensions that must be given in ordering the various kinds of gears are included, together with a table of standard keyseat dimensions and other tables of useful information. The second catalog gives some of the advantages of the company's friction clutch, such as small number of parts, simplicity of construction, easy adjustment and the absence of springs. Following this illustrations and tables of the various clutches that can be supplied are presented including one giving the dimensions of the various parts.